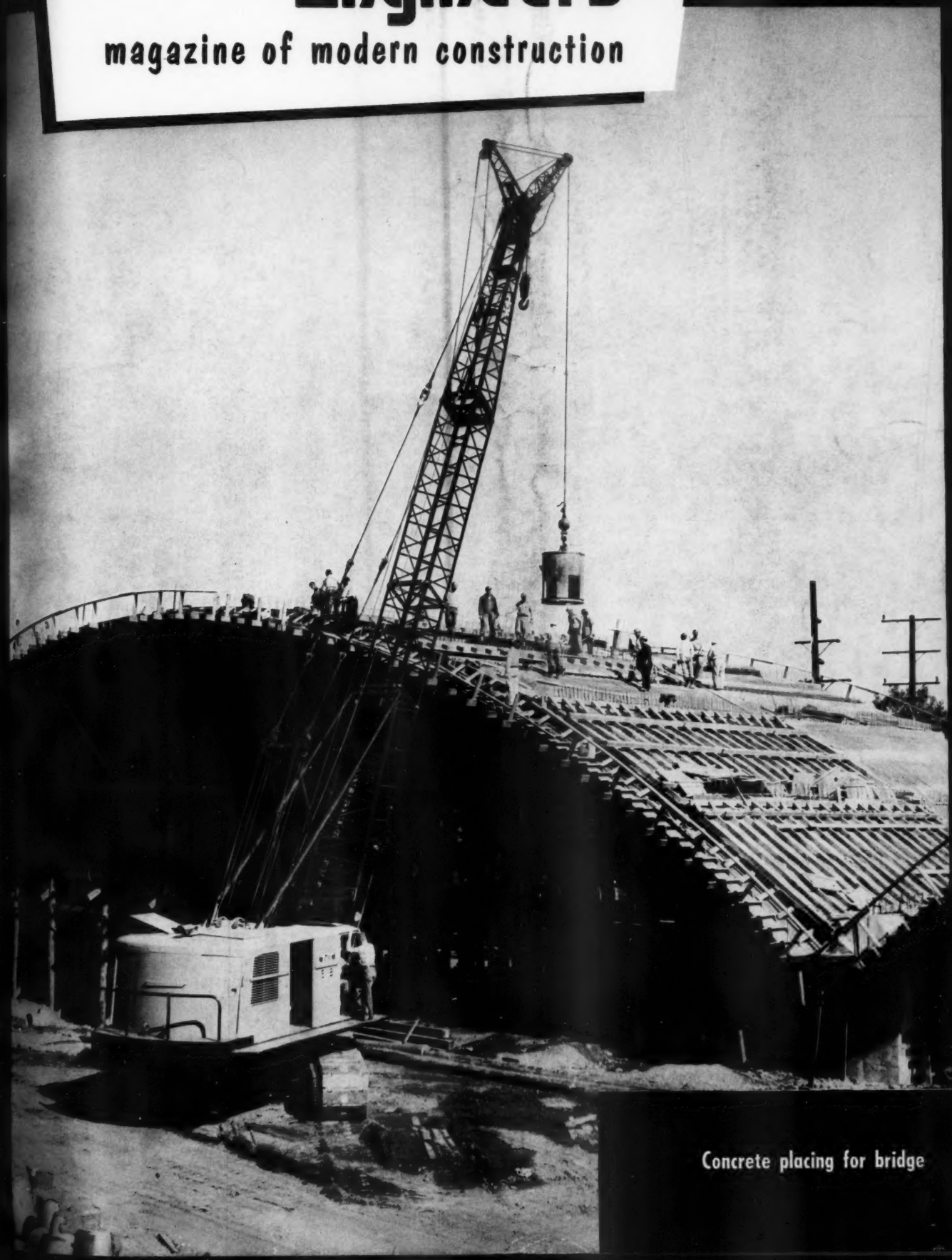
Contractors and Engineers

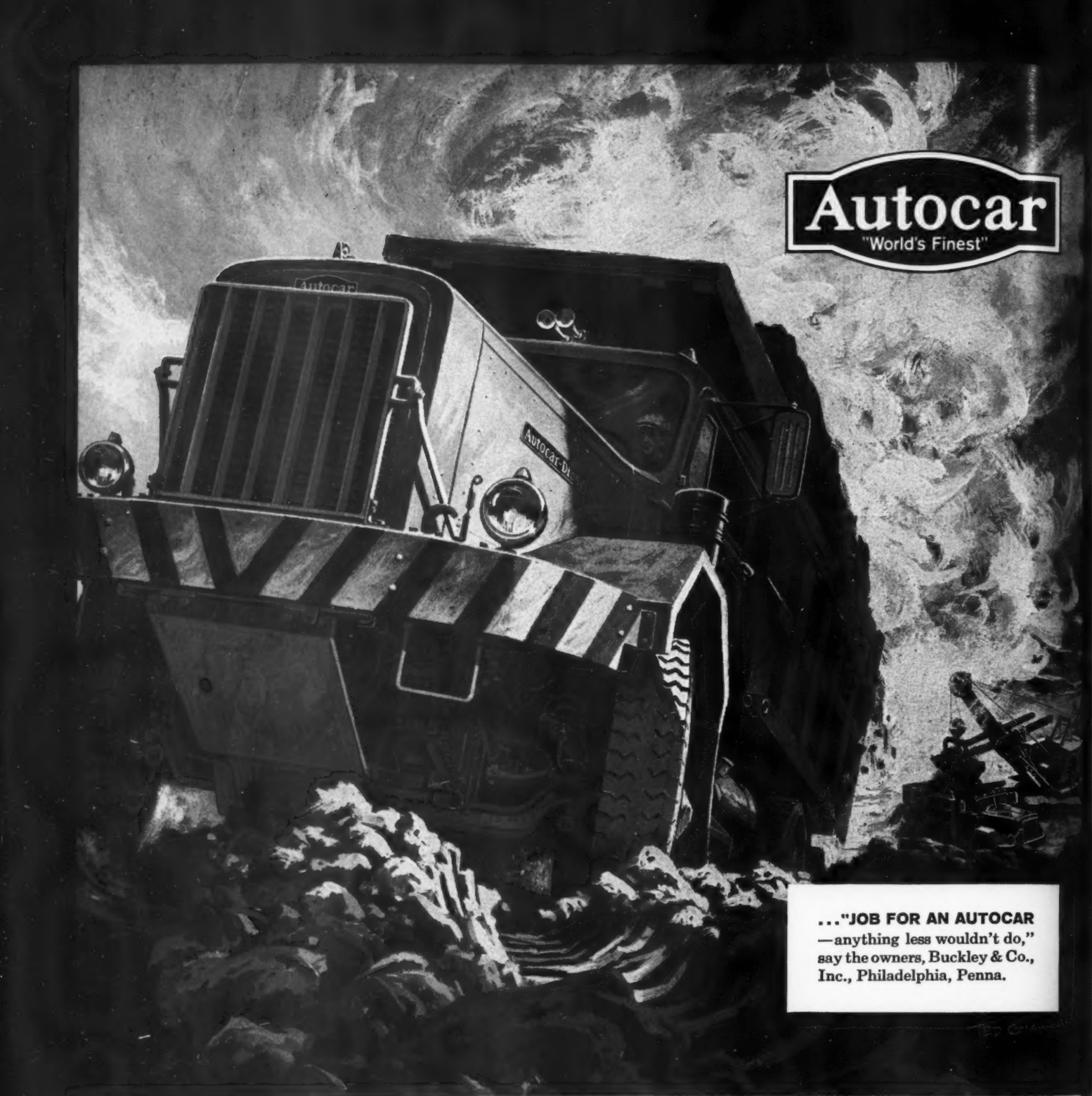
magazine of modern construction

APRIL 1959

A Buttenheim Publication



Concrete placing for bridge



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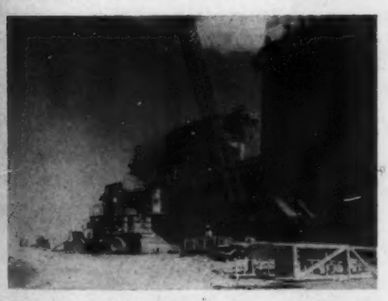

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Editorial

Procedure vs. performance

Last month we editorialized about job specifications, recommending changes in some and offering to contractors a few suggestions on how to avoid complications in bidding. In addition to job specifications, another controlling factor in performing a contract is the building code of the governmental unit—city, state, county, etc.—that is in force. Many of these codes have been in effect for half a century or more, with few if any changes made in consideration of new techniques and materials that have been developed over the years.

The principal shortcoming of many of these codes is that they stress procedures or certain materials rather than performance. Almost everyone knows, for instance, that one of the largest cities in the nation for many years specified that all concrete used in a building project must be mixed at the site. This ruling was enforced despite the performance of ready-mix concrete and the quality standards to which it tested.

If performance were the sole criterion, the inventors and designers of new materials and machines would be encouraged to develop money-saving techniques, machines, and materials that would encourage more construction. The classic example in earthmoving of procedures vs. performance is found in the compaction of fills. Hidebound specifications call for certain procedures—such as so many passes of a certain type of roller, weighing so many tons, over lifts of prescribed depth. A similar code, based on performance, would require that a specified density at optimum moisture be achieved, with no mention of methods to be used. This would allow the contractor to exercise his ingenuity and to choose from a wide selection of equipment to attain the desired results. With a definite end result specified, the owner or agency would get the compaction wanted—and quite possibly at a lower cost than if it also specified how, and with what equipment, the work should be done.

The owner or agency need not feel that steps seeming to favor the contractor are one-way avenues of assistance. Such moves encourage competition and are reflected in lower bid prices.

Another area where some correction is in order is the delay by public agencies in awarding contracts after bid openings. The American Road Builders' Association, in reviewing contractors' problems through circulated questionnaires, reported that some states take as long as three months to award a contract after bids are opened. The average contractor feels that only about three weeks are necessary for him to prepare for work.

The long delays are caused by slow procedures in acquiring right-of-ways and getting utilities removed from the highway. Speeding up the paper work involved and obtaining the right-of-way before and not after bids are opened were among the suggestions advanced by contractors to eliminate these delays and to get the badly needed construction started. Everyone profits by speeding up the preliminaries to construction: the agency or governmental unit, by keeping its program on schedule; the contractor, by getting his men and equipment to work at the earliest possible time; and, of course, the public, which gets to use the new facility that much sooner.

CONTRACTORS AND ENGINEERS

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A Bucyrus-Erie 51-B lifts a Blaw-Knox bucket to form on one of the thin-shell arches for an Illinois Toll Highway bridge near Aurora. The entire arch was poured in 8 main sections; top forms were used for lower pours. Page 48.

Borrow is a breeze on relocation job

A 2.6-mile-long relocation job involving more than 700,000 cubic yards of excavation has been pushed to completion a full year ahead of schedule because of a Massachusetts contractor's ingenuity in obtaining the large amount of needed borrow.

Bayer & Mingolla Construction Co., Inc., Worcester, which had the contract for this $1,760,300 project near Lowell and Chelmsford, moved an average of 3,500 yards of borrow every 8½-hour day. This production was made possible largely because borrow was obtained from a knoll paralleling the right-of-way.

The contractor used three Caterpillar DW21 scrapers to move 622,000 cubic yards of borrow and 95,000 yards of roadway excavation. Over 400,000 yards of borrow was placed in a rotary which is considered the largest ever built in the state. It measures nearly 2,500 feet in diameter, and interconnects State Route 4, U. S. 3, and Westford Road.

The fact that borrow for the rotary was obtained from a knoll along the right-of-way permitted the contractor to push-load the scrapers downhill. Average haul distance between the knoll and rotary was about 1,500 feet.

A Cat D9 tractor was used to push-load the scrapers on the knoll, while a D8 and Cat No. 12 grader spread and shaped the fills. Compaction was handled by three rollers—two Buffalo-Springfields and a Galion 3-axle tandem.

Besides the borrow required on the job, Bayer & Mingolla had to excavate 64,000 cubic yards of peat muck from the roadway alignment. This was handled by a Lorain crane equipped with a 1¾-yard dragline bucket.

The contractor used an Ingersoll-Rand wagon drill and two jackhammers, powered by an I-R 315-cfm air compressor, to drill and remove the small amount of rock on the job.

A 12-inch blanket of gravel was placed atop the compacted subgrade by a Blaw-Knox stone spreader. The material was placed in two 6-inch lifts. After both lifts were placed and compacted by the steel-wheel rollers, a 4½-inch lift of crushed traprock was put down in a single lift.

This course was penetrated with asphalt by a Littleford pressure distributor and then topped with a 1¼-inch binder course and a 1¼-inch wearing surface of asphaltic concrete.

The paving of the two 24-foot roadways, subcontracted to George Brox Co., Hudson, Mass., was done in 12-foot widths by a Barber-Greene paver.

After the eastbound roadway was completed for a distance of about 9,000 feet, 2-way traffic was routed onto it, thus allowing the contractor to resurface the existing U.S. 3 with 2½ inches of asphaltic concrete. The existing roadway surface was repaired —that is, dips and bumps were removed—prior to resurfacing.

Vincent J. Volpe was project superintendent, and he kept in touch with the other supervisory personnel by means of a Motorola mobile radio system. Duncan Munro was the contractor's assistant superintendent and William King, the bridge superintendent. Horace LeGacy was resident engineer on the job for the Massachusetts Department of Public Works.

THE END

The DW21's load quickly on the downgrade of the knoll, sometimes picking up as much as half of their load without an assist from the pusher. Three Cat scrapers handled more than 400,000 cubic yards of borrow from this area.

Up to 4,800 yards of concrete is batched by this Noble setup in an 11-hour day to supply a total of five pavers working on runway, apron, and taxiway paving, at Griffiss AFB near Rome, N. Y. Three conveyors bring aggregates from truck hoppers to surge piles.

Typical of the 160-foot-long conveyors charging the twin 350-ton aggregate bins is this one, with Cedarapids rollers and Boston Woven Hose & Rubber belts.

High-output concrete plant feeds multipaver spreads

Three and two-paver spreads work different parts of air-base job; fast-moving equipment places some 4,800 yards of concrete daily

Cement goes to the storage and batching silos by three screw conveyors leading from under-track hopper positions to an enclosed elevator.

by ANTHONY N. MAVROUDIS
field editor

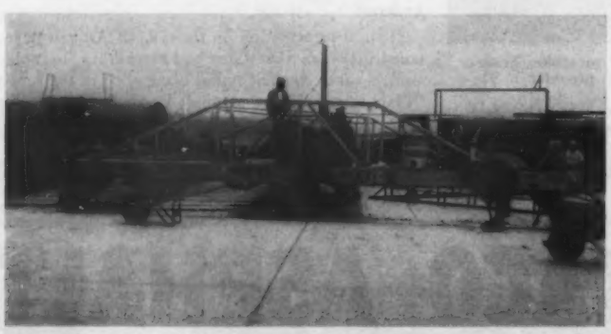
An elaborate batching operation, used to supply concrete mix for the paving of new facilities at Griffiss Air Force Base near Rome, N. Y., produced up to 4,800 cubic yards of concrete during an 11-hour workday. George M. Brewster & Son, Inc., Bogota, N. J., the contractor on this $21 million project, used a Noble 600-yard-per-hour batch plant, together with two paving spreads, to do the job.

The project actually consisted of two contracts: one for the 11,820× 300-foot runway, the aprons and taxiways; the other for SAC and taxiway support facilities.

The batch plant actually consisted

The 2-paver spread on apron and taxiway paving uses Koehring 34-E's fed by Mack 6-batch trucks. The Heltzel steel forms support transverse dowels.

As the spreader moves along, it pulls 11 Maginniss electric vibrators through the concrete. A generator on the spreader powers the vibrators.



Next in line is a Lewis float finisher, supporting two transverse screeds and a V-shaped float. It keeps within the ⅛-inch tolerance allowed.

A rough-textured finish is given to the slab by the next rigs in the lineup—two burlap drags. They roll on the forms and on the adjacent slab.

One of the fleet of 55 trucks used to deliver aggregate to the plant stops on the 75-ton-capacity Howe truck-scale platform installed along the haul route.

Stockpiled stone, ready to be fed to the conveyor leading to the surge pile, is shaped up by a Cat D8 tractor-dozer.

of twin 350-ton aggregate bins; twin 600-barrel cement-batching silos; and a 4,000-barrel ground-storage silo for cement.

Each aggregate bin, having 3 compartments, was charged from three surge piles by means of reclaiming tunnels and 160-foot-long conveyors. The surge piles, in turn, were formed by three 130-foot-long conveyors that transferred the aggregates from ground-level truck hoppers located adjacent to the three main aggregate stockpiles. A total of 55 dump trucks was used to haul in the sand, No. 3 stone, and a mix of No. 1 and No. 2 stone. Aggregates were either dumped directly into the 20-ton hoppers feeding the surge-pile conveyors, or into the stockpiles. A Howe 75-ton truck-scale platform was positioned along the haul route to weigh all incoming trucks.

A Cat D8 tractor-dozer shaped the stockpiles as aggregates were delivered and also assisted the two Hough front-end loaders that transferred the aggregates from the stockpiles to the hoppers. The Noble conveyors, feeding both the surge piles and the aggregate bins, were equipped with Cedarapids rollers and 24-inch-wide Boston Woven Hose conveyor belts.

The three surge piles covered a 40-foot-long Noble reclaiming tunnel equipped with three electrically operated gates. The tunnel gates were handled by an operator, located atop the aggregate bins; this operator also controlled the 2-way chutes at the end of each conveyor.

Cement—both North American and Huron—was delivered to the batch plant by means of twin rail spurs running adjacent to the ground-storage silo. The bottom-dump rail cars had three undertrack unloading points that fed three screw conveyors to charge the 4,000-barrel silo. On an average, 20 rail cars were unloaded during each day of paving. The three screw conveyors charged an enclosed bucket elevator which, through a 3-way chute, raised the cement to the storage silo or to the two 600-barrel batching silos. Cement was transferred from the silos to the weigh batchers by fast-loading screw conveyors. Noble controls and scales made the weighing and batching cycles an automatic operation. Electric power to run the plant was purchased from the air-base supply. Air for the plant was supplied by a Chicago Pneumatic electrically driven air compressor.

(*Continued on next page*)

Following the second paver is a Blaw-Knox spreader, riding forms and the completed slab as it strikes off concrete to a 17-inch thickness.

A hand-finishing crew follows the Lewis float finisher to smooth the slab surface with Cleveland aluminum straightedges.

(Continued from preceding page)

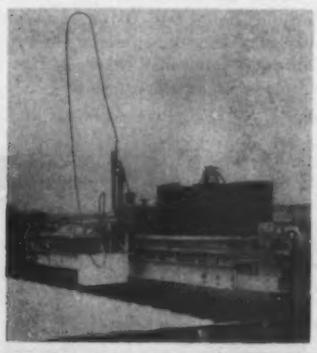
Paving spreads

Brewster used 18 Mack batch trucks, each with a 6-batch capacity, to haul the dry concrete mix to the two paving spreads. One spread, consisting of three Koehring 34-E pavers, a Blaw-Knox spreader, a Lewis float finisher and a Rex spray machine, was used to pave the runway. A similar spread—but with two Koehring 34-E pavers—handled the apron and taxiway surfacing. All paving was done in 25-foot widths.

Over 14,000 linear feet of Heltzel reversible steel forms was on the job to handle the 14 to 17-inch slab thicknesses. One side of the form sections had a 14-inch wall, while the other side was 17 inches high. Both sides were usable; when one side was to be used, the form stakes were driven through the other side. Stakes were driven by an air hammer powered by a Cummins air compressor.

The Koehring pavers led off the spreads, dumping mix in front of the Blaw-Knox spreader. The spreaders were equipped with eleven Maginniss electric rear-mounted full-depth vibrators powered by a generator on the spreader; the vibrators were pulled through the unreinforced lane as the spreader moved forward.

Following the spreader in each lineup was a Lewis longitudinal float finisher. This rig easily kept pace with the two or three-paver setup. Equipped with two transverse screeds, supported by the machine, and a rear V-shaped float, this rig maintained the close surface tolerances required. There could be no more than ⅛-inch variation within 16 feet, measured



This Rex spray machine, stopped at the end of an apron slab, followed the paving crew to apply Murphy-Phoenix white-pigmented curing compound to the concrete.

transversely or longitudinally, and those results were obtained with the Lewis machine. This rig operated so fast that it was able to make a few passes over the slab surface and still maintain its pace with the multi-paver spreads.

Surface dragged

Hand-finishing crews, using Cleveland aluminum straightedges, worked closely behind the Lewis machine to place the final touches on the slab surface. Two burlap drags, rolling on the forms or adjacent slab, were then pulled over the concrete to give the slab surface a rough-textured finish.

A Rex spray machine brought up the rear of the paving spread, spraying Murphy-Phoenix white-pigmented curing compound on the completed slab. This made it possible for an Austin-Western hydraulic crane to strip the forms and load them on a truck to be moved ahead of the paving spread.

Since the paving was done in 25-foot widths, the longitudinal joints were automatically formed between adjacent lanes. Transverse joints, on the other hand, were sawed by Felker portable saws using diamond blades. Depths were determined by dividing the slab thickness by four. Concrete sawing generally began about 8 hours after the concrete was placed.

Water supply

Brewster had to pump water from the Mohawk River to supply the paving spreads and to provide the water required for proper compaction of the base-course material. An elevated 15,000-gallon water tank, set up near one end of the runway, required about 3 miles of 8-inch aluminum irrigation pipe to pump the water from the river. Two Chrysler-driven Hale 1,000-gpm pumps, one acting as a standby, handled the pumping assignment on the project.

Water tankers furnishing water to the paving spreads—and for compaction of the apron area—fill up at a 15,000-gallon elevated water tank supplied by a 3-mile-long aluminum pipe. Water had to be pumped from the Mohawk River to this end of the runway area.

Since the water line ran parallel to the runway, ten takeoffs were incorporated in the pipe to supply the three pavers of the spread. Rubber hoses transferred the water from the takeoffs to the water tankers supplying the pavers. The water, tapped from the 15,000-gallon-tank during the runway paving, was used for the compaction of the apron area. This water was later used to supply the spread paving the aprons.

The 11,820-foot runway, which also has two 1,000-foot overruns, was paved in two 5,910-foot-long sections. Each section was paved in the same manner: Crews started with a 25-foot pilot lane adjacent to the runway center line, and then worked in a counterclockwise direction around this lane. Slab thicknesses varied from 14 to 17 inches for the runway and 16 to 17 inches for the two 800× 1,450 aprons and the 75-foot-wide taxiways.

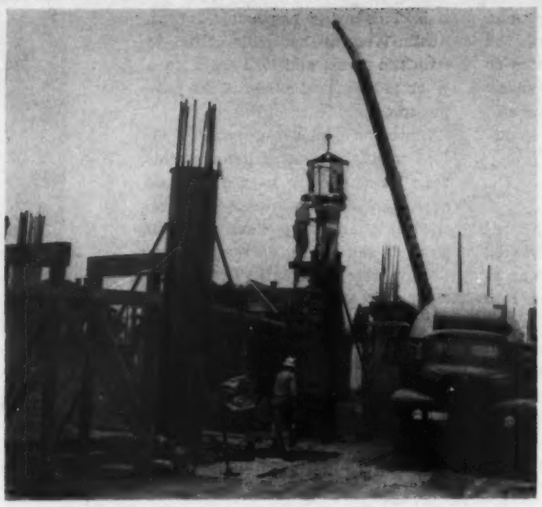
Personnel

E. D. Brown was the resident manager; Lou Frankenfield, the general superintendent; Frank Itro, the paving superintendent; Bill Foley, the equipment superintendent; George Badaracco, the plant superintendent; and John Dunn, the project engineer for Brewster. Norman Clark was the resident engineer for the New York District, U. S. Army Corps of Engineers. THE END

New Clark representative

Clark Equipment International, C. A., has appointed Dennis T. Buckley district manager for Africa. Buckley will be responsible for sales in Africa of the Michigan line of construction machinery manufactured by the firm's Construction Machinery Division, as well as the line of fork trucks and other material-handling equipment produced by the Industrial Truck Division. His headquarters will be in Johannesburg, South Africa.

Four contractors build large shopping center



An efficient column operation is done by crews of Max J. Kuney Co., Spokane, Wash., one of the contractors for the 100-store shopping center in Portland, Ore. Workmen on the platform place the concrete delivered in a Gar-Bro ½-yard bucket by a Pitman Hydra-Lift. The International-mounted Smith mixer brings the concrete to the site.

When work started on the $30 million Lloyd Center and adjoining $5 million Sheraton-Portland Hotel in the heart of Portland, Ore., four contractors turned the 56-acre site into a beehive of activity that was halted not long after the start of the project by a 35-day strike. But when the strike was over, the contractors really turned on the steam to get the job up out of the ground and to make up lost time.

One of the nation's largest business-shopping developments, Lloyd Center will have more than 100 stores sharing 1,200,000 square feet of floor space. Parking space on the street level and the first level below will accommodate 8,000 automobiles. The adjoining 9-story Sheraton-Portland Hotel will have 300 guest rooms, an outdoor swimming pool, and parking for 305 cars.

The buildings, primarily of reinforced-concrete construction, feature long-span pans for the floor systems. Donald M. Drake Co., Portland, holds two of the major contracts totaling approximately $15 million and including the 5-story Meier & Frank store, which will be the second largest store in Oregon. Max J. Kuney Co., Spokane, has a $5½ million contract that includes the construction of stores for Woolworth Co. and J. C. Penney Co. Both of these contracts also call for the construction of some of the structures which will be divided into smaller units.

A large 2-level grocery store—the largest Safeway store in the Northwest—is one of the structures being built by Henry M. Mason Co., Portland. This will be the first store in the center to be completed and put to use. Mason, also building a similar structure for another supermarket, has two contracts totaling $1¼ million.

While the Sheraton-Portland Hotel is not in Lloyd Center proper, it is on a Lloyd Corp. development immediately adjacent. Hoffman Construction Co., Portland, is the general contractor for the hotel, which is being built for the Sheraton Corp. of America.

Getting out of the mud

Starting as early in the season as weather conditions would permit, R.

New project will have 1,200,000 square feet of floor space; continuous 705-yard pour made for footing of adjacent hotel

Donald M. Drake Co., Portland, made fast work of placing concrete for stores in the Center with a Wagner Mixermobile and buggy operation. A Smith mixer on a Reo truck delivers the concrete to the Mixermobile.

A. Heintz Construction Co., Portland, began the general site grading. Since most of the site will contain a parking area below street level, the big grading job was to remove some 500,000 cubic yards of material from the site. Heintz used a spread of scrapers, drawn by crawler and rubber-tire tractors, to make the excavation and move the material into stockpiles and into a nearby ravine.

The building contractors moved in right behind the grading crews to excavate for the spread footings on which the buildings were founded. Most of these footings were poured directly from transit mixers. This work was just getting well under way when construction throughout Oregon was shut down by a strike that lasted 35 days. The contractors realized that when the strike ended they would not be able to use greatly enlarged crews, since there was not enough room at the site. To make up for lost time, the contractors stepped up their speed by improving techniques and making better use of their equipment.

Kuney's operations typify this. To form the many big round columns for the lower level, this contractor used sectional steel forms held plumb by four adjustable steel braces.

A workman first set a Phillips Red Head concrete fastener in each corner of the column footing using a Thor utility hammer. The steel column form was assembled on the ground with the four braces attached to the upper section. A Pitman Hydra-Lift set the form in place over the reinforcing steel cage, and workmen quickly attached the braces to the anchors in the footing and plumbed the form.

A place for workmen to stand while filling the form with concrete was provided by a combined ladder and platform set up against the form. One edge of the platform, fitted around the form, rested on the lower flange of the top section. The outer edge was supported by the legs of the ladder, which rested on the concrete footing below. This sturdy platform was large enough for two men, yet was light enough so that it could be quickly and easily moved from one column to the next.

(Continued on next page)

Whiteman power buggies, placing concrete for a store, are loaded at the double-gated hopper on the Mixermobile tower.

Although general excavation was done under a separate prime contract, each of the contractors handled his own footing excavations, backfill, and grading operations. This Bucyrus-Erie 15-B hoe is excavating footings under the Kuney contract. This firm holds a $5½ million contract for stores in the development.

(*Continued from preceding page*)

The area around the columns was kept clear for transit mixers bringing the concrete to each column. Most of the concrete was bucketed to the forms in a Gar-Bro ½-yard bucket handled by the Pitman Hydra-Lift. The mix was consolidated by Homelite vibrators powered by Homelite generators.

These forms were quickly and easily stripped and moved to new footings as blankets were wrapped around the green columns for curing with water. Kuney also used some Sonotube column forms, as did some of the other contractors. Where these were used, the concrete was usually placed after the deck forms were set.

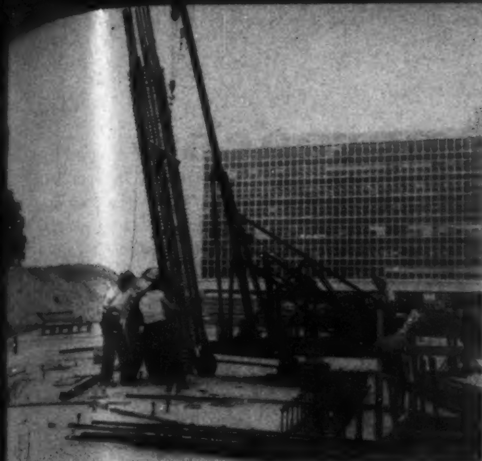
Deck shoring

To shore the interior and spandrel beams for the pan slabs and the flat slab decks, Kuney used a combination of steel and timber shoring. Timber shoring towers were shop-fabricated to a constant 8-foot height and adjustment was obtained by placing these timber towers on top of steel towers of varying heights, constructed of Beatty heavy-duty steel scaffolding. The timber towers had scaffold pins or pipe sleeves fitted on each leg; these slipped into the legs of the steel scaffold. Adjustment screws in the bottom of the steel scaffold legs were used to bring all these towers to the same grade and to level them on the timber sills which supported them. The Pitman Hydra-Lift or a Hyster fork truck set the timber towers in place on the scaffolds.

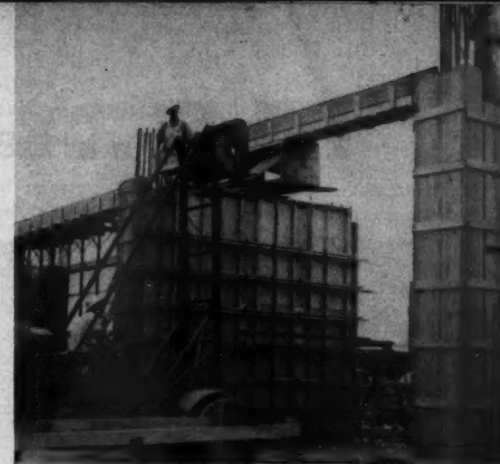
Long-span steel pans formed the deck. These were supported between the marginal beams by rows of double 4×4 shores with Ellis clamps. The steel forms were supported by 2×6 ledgers. The long pans span 8 feet between supports requiring only two rows of shores for the 24-foot-wide spans. Pans were furnished and erected by Soule Steel Co., San Francisco. Soule also furnished and placed most of the reinforcing for the structures.

Mixermobile places concrete

Drake set a fast pace in concrete placement using Wagner Mixermobiles and power buggies. This con-



While the 100-store shopping center is under construction, Hoffman Construction Co., Portland, is building the 9-story Sheraton-Portland Hotel that will be adjacent to the big development. Here, a reinforcing cage for one of the round concrete columns on the first-floor level is being set by a King winch on a 3-wheel "grasshopper."



A Wagner Scoopmobile is used to set prefabricated form sections in place for the hotel. The wall form in the center is tied with W. J. Burke ties. In the background, Acrow steel shores support the beam forms.

tractor had three of the M7 Mixermobiles on the job, plus a fleet of Whiteman power buggies. These rigs placed all the concrete from the first-floor deck to the roof slabs of all the structures, including the 5-story Meier & Frank building.

Transit mixers from Ross Island Premix Concrete Co. and Pacific Building Supply Co. delivered the concrete to the job, depositing it in the skips of the Mixermobiles. The Mixermobiles hoisted the concrete to double-compartment bins suspended from the tower at the floor level where the concrete was being placed. The Whiteman buggies loaded from these hoppers and quickly delivered the mix to the placing crew anywhere on the deck. Air-operated gates on the hoppers speeded the loading of the buggies.

The mix was vibrated into place and slabs were finished with a Whiteman power troweling machine.

Mason used similar methods of construction using Sonotube, Soule long-span pans, and buggies for placement of deck concrete. The superstructures of the buildings built by Mason are structural-steel frames with masonry walls as contrasted with the reinforced-concrete construction for the other buildings. By working supervisory personnel through the strike period, Mason was farther along and had less worry about wet weather than the other contractors.

Use tower on hotel

The several floors of the hotel contain a variety of types of design and construction, including flat slabs, pan joists, beams and girders, and even some structural steel. Exterior walls are of porcelain-enameled panels with aluminum and glass on two sides of the structure and brick masonry on the other two sides.

A portion of the structure is founded on a huge concrete footing containing 705 cubic yards of concrete that was placed in a continuous pour. Nineteen truck mixers worked for 12 hours shuttling concrete to the site; four power buggies filled one side of the form, and the mix was chuted to the other side.

Forms for the building were fab-

(Continued on page 15)

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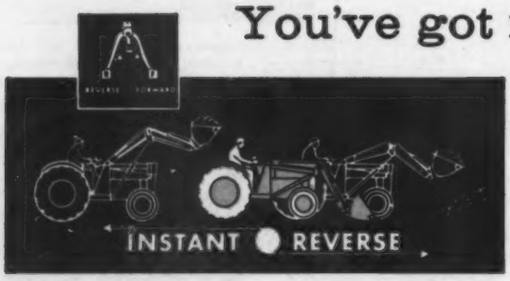
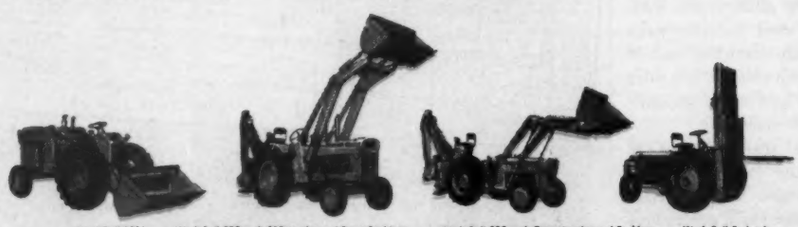


You've got it Coming... or Going on the New WORK BULL 204 with Torque Converter

Massey-Ferguson again shows its leadership in the industrial field with the most important development ever made on industrial utility tractors. This all-new, field-proven Work Bull 204 changes directions instantly, but smoothly, at the touch of your toe – and has a torque converter to maintain correct power-to-load ratio. An efficient 3-point pedal control lets you select forward, reverse, or just engine acceleration. Your hands are free to control the tractor or Davis Loader attachment.

The Work Bull 204 has a high-torque, 40-hp engine with four equal speeds in either direction to provide a wide work range as well as a favorable road speed. It has full-time power steering, individual left and right brakes, and a hand throttle to pre-set engine rpm for operating attachments. The exclusive Ferguson 3-point hitch provides hydraulic draft control for rear-end attachments. Your choice of new model Davis Loaders, Backhoes, Scarifier-Scrapers, or other power-matched M-F attachments gives you the best all-around rig you could ever own. ***Write for the name of nearest dealer and see him soon.***



Work Bull 1001 Work Bull 303 with 500 Loader and Davis Backhoe Work Bull 202 with Davis Loader and Backhoe Work Bull Fork Lift

MASSEY-FERGUSON INDUSTRIAL DIVISION
1009 SOUTH WEST STREET • WICHITA 13N, KANSAS

For more facts, use Request Card at page 18 and circle No. 209

(Continued from page 13)

ricated in a well equipped form yard and erected in sections. Beam and slab forms were fabricated of ¾-inch Plyform panels and shored with Acrow adjustable steel forms.

To serve the construction above the first floor, the contractor erected a tower 165 feet high. This tower was fitted with a concrete skip, a side hoist for material, and a Chicago boom. Whiteman power buggies transported the concrete from the 2-yard hopper at the tower to the placement crews. An average typical floor above the third was placed in about six days. The structure required a total of 10,500 cubic yards of concrete and 1,100 tons of reinforcing steel.

The Sheraton-Portland Hotel will open on schedule late this year. Most of the stores in the Lloyd Center structures will open during 1960.

Personnel

Hoffman Construction Co.'s project engineer on the hotel structure is R. C. Van Deusen; Ralph Shook is superintendent. Crews of Donald M. Drake Co. work under general superintendent Webb E. Smith. Ralph E. Grant serves as superintendent on one of the contracts, and Jimmy Nelson superintends the other. Max J. Kuney is represented on the job by project manager Sam Claggett and superintendent Ralph E. "Jim" Overmyer. For Henry M. Mason Co., Merle C. Stearns is project superintendent.

The Sheraton-Portland Hotel was designed by Perry, Shaw, Hepburn & Dean, Boston, Mass., with Church, Newberry, Roehr & Schuette, Portland, as associate architects. Herschell Plummer is clerk of the works for the Sheraton Corp.

The Lloyd Center structures were designed by John Graham & Co., architects and engineers of Seattle, Wash. Project manager for the Lloyd Corp., Ltd., is Richard C. Horn.

THE END

Research team studies reinforced-concrete roads

The Maryland State Roads Commission and the University of Maryland are combining forces on a research project to study continuously steel-reinforced concrete pavements.

The project will be along the Baltimore-Harrisburg Expressway between Mt. Carmel Road and Middletown Road, which the commission will soon place under contract for the southbound lane. At present, only the northbound lane of the ultimate dual highway is in use between Shawan Road and Middletown Road.

The research team will study the construction methods and what actions are taking place inside the pavement, while it is under construction and for as long as 10 years after it is in use.

A system of complex electronic instruments has been developed for the project.

For more facts, circle No. 210→

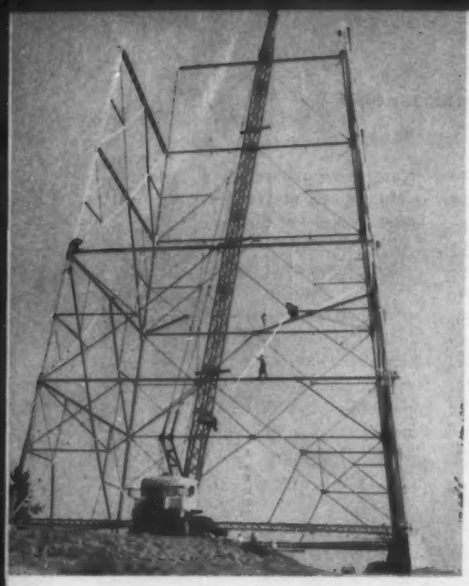
New electric motor saves on yearly maintenance and costly shutdowns of asphalt plant

When a steam-engine crankshaft broke, all operations in the asphalt plant of A. E. Stone, Inc., Pleasantville, N. J., were shut down for several days. At $500 per hour, the lost production was staggering.

To prevent this from recurring, the firm asked The American Pulley Co., Philadelphia, to find out how to take some of the load off the engine; to drive some of the essential equipment independent of the engine; to reduce maintenance cost; and to improve safety. The survey showed two pieces of equipment in which all of these aims could be achieved.

The rotary dryer was definitely the most expensive to maintain and consumed the most power. A maintenance record on the unit showed that the roller chain drive had to be replaced each year, and a set of bevel gears had to be replaced every three years. These two parts were replaced with a 30-hp electric motor stepped down through a 13:1-ratio Shaft-King speed reducer to a jackshaft output speed of 110 rpm. The final rotating speed of the dryer is 12 rpm.

The bucket-elevator drive presented a different problem, since it had to be mounted above ground level and could be subjected to heavy shock loads. The same type of speed reduction drive with a 20:1 ratio was installed, as the Shaft-King needs no mounting other than input and output shafts. A torque-arm overload release was included.



After working inside the tower area to bring steel to a 165-foot height for three sides of a transmission tower, the Lorain backs out to set bracing for the fourth side. The tower is for a line over the Columbia River from Vancouver, Wash., to Portland, Ore. The crane works with 135 feet of boom and a 40-foot jib.

Crane and gin pole lift high steel into pla tra

Erection of the new high towers that carry Pacific Power & Light Co. 115,000-volt transmission lines across the Columbia River from Vancouver, Wash., to Portland, Ore., required a combination of daring and skilled workmen, construction know-how, and a few pieces of special equipment. The two tallest towers at the ends of the 3,300-foot span over the main shipping channel rise 485 feet above the foundations, a height equivalent to that of a 36-story building.

The 7-tower crossing was built for PP&L by Pettijohn Engineering Co., Portland. The $687,000 overhead crossing replaces an existing submarine cable, which was becoming overloaded with the installation of additional generating capacity at Merwin power plant on the Lewis River in Washington.

In addition to the two high towers

Concrete for pedestal footings for a tall tower is chuted into place from a Rex mixer on an International truck. Workmen at left are consolidating the concrete with a Viber vibrator.

transmission towers

for the main channel crossing, five other towers carry the conductors across the adjacent slough and lowlands a total distance of 9,890 feet between the "dead-end" towers. The three steel-reinforced aluminum conductors, 1 inch in diameter, are hung on one side of the three crossarms of the towers. Three additional cables can be added on the other side to provide additional capacity for bringing Lewis River power into the rapidly growing Portland area.

Concrete bases

Each of the towers is founded on concrete pedestals that have slight variations in dimensions, depending on the loading, soil conditions, and topography. One typical tower has pedestals with footings 17 feet square and 3 feet deep. The pedestals rise 28 feet above the footings and taper

(Continued on next page)

For more facts, use Request Card at page 18 and circle No. 211

As steel is laid out for a new tower by the crane, workmen assemble the members with Ingersoll-Rand 9U impact wrenches powered by an Onan portable generator. Tower members are all connected with galvanized bolts and lock washers tightened by impact or hand wrenches.

(*Continued from preceding page*)

from 12.33 feet square at the bottom to 3.5 feet square at the top. All concrete bases are set on Class A piles 65 feet long, the number per base ranging from 9 to 17.

Footings and pedestals were formed with prefabricated wood form panels tied with Superior hardware. A truck-mounted Bucyrus-Erie Hydrocrane handled the form panels and the reinforcing cages for the bases. Transit-mix concrete was chuted directly from the trucks to the footings. Concrete in the pedestals was placed from Gar-Bro buckets handled by a Lorain 35-ton truck crane. The mix was consolidated by Viber electric vibrators powered by Homelite generators.

With the concrete in place and the forms removed, dozers backfilled the excavations, leaving just the top few feet of the pedestals exposed.

Steel erection

The galvanized-steel tower members were fabricated by Bethlehem-Pacific Steel Co. and trucked to the several tower sites. The contractor used a Lorain TL-15 crawler crane to yard the steel, while a boom truck helped shuttle the pieces to the assembly crew.

To start the big towers, the crew first assembled the level struts connecting the four corners of the 89-foot-square base. The component sections were set into place by a Lorain 35-ton motor crane and bolted together with the aid of Ingersoll-Rand 9U impact wrenches powered by two Onan portable generators. These generators also operated drills and reamers used by the steel erectors.

Seventy-foot sections of the tower legs were next assembled on the ground, set in place by the crane, and guyed with cables. The bracing fill for each side was built up on the ground and set between the columns as a unit. For these early erection stages, the Lorain crane was located inside the tower. The bracing sections were installed on three sides, leaving the fourth side open so that the crane could get out.

Additional segments of legs and bracing were added in 32.5-foot increments until the tower reached a height of about 165 feet. When work reached this level, the crane, equipped with a 135-foot boom and 40 feet of jib, set a wooden gin pole in place and then pulled out of the tower to set the bracing for the fourth side, plus the internal cross braces.

From the 165-foot level to the top of the towers, the hoisting was handled by the 80-foot strutted wood gin pole with lines operated by a 3-drum Skagit winch powered by a Ford industrial engine. Legs and bracing were handled separately up to about the 430-foot level. From here up, the sections were lighter, and units consisting of two legs and the bracing between were hoisted and set intact. The maximum lift handled by the gin pole was about 5,800 pounds, although some of the lower sections handled by the crane weighed up to 7,000 pounds.

One of the tricky operations was the setting of the top crossarm of the tower. This was done by laying the gin pole out at enough of an angle to suspend the crossarm steel alongside the tower. The two lower crossarms were erected by the use of a

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block attached to the upper crossarm.

The workmen completely bolted up each section of the tower as they set it in place. All of the connections were made with galvanized bolts and lock washers. Connections made in the air were tightened by hand ratchet wrenches. The 12-man crew set each of the 485-foot-high towers in about 28 working days.

Stringing the conductors

Stringing the six miles of 1-inch conductor was quite a job in itself. A ½-inch steel cable was first raised to the top of each tower, and the conductors were pulled in place with this cable. A tug carried the cable across the river; then the conductors were winched across one at a time. A snubbing device on a truck kept these cables up out of the way of navigation during the time they were being placed. Final sagging was done with the aid of a Caterpillar D6 tractor. In their final position, the conductors clear the river by 221 feet at their lowest point.

Personnel

The contract for Pettijohn Engineering Co. was supervised by general superintendent Verle Devaney. General foreman on the work was Earl Turner. Steel erection foreman was John Smith. Chief field engineer for PP&L is Hank Gibbs. Bruce Aaron, chief design engineer, and Henry W. Gibbs, design engineer, handled the project for PP&L.

THE END

Civil Service exams for civil engineers

Engineers interested in beginning a career in the development of water resources in the West are being sought for employment with the Bureau of Reclamation. The bureau plans, designs, and builds engineering works to supply irrigation water to farms in the 17 westernmost states.

The jobs to be filled pay starting salaries of $4,490, $5,430, and $6,285 per year. Practically every type of civil engineering is used in the bureau's design and construction work.

Details about the jobs to be filled, the requirements to be met, and instructions for applying are given in civil service announcement No. 10-1-1(59). Civil service announcements and applications are available from many post offices throughout the country or from the United States Civil Service Commission, Washington 25, D. C.

The Highway Trust Fund had a credit balance of $512,346,333 on January 31, 1959, according to the U. S. Treasury Department. This credit balance consists of $281,625,000 in Treasury certificates bearing interest at 2.5 per cent and $230,721,333 in undisbursed funds.

For more facts, circle No. 213→

PAVING RIGS get a good going-over at the Bituminous Concrete Plant-Mix School in the North Carolina State Fair Arena, Raleigh. The week-long meeting in February was sponsored by the North Carolina State College, the North Carolina State Highway and Public Works Commission, the U. S. Bureau of Public Roads, and the Carolina Asphalt Association. In the foreground at the equipment exhibit are a Vibro-Plus Terrapac roller and a Pioneer Vibromatic paver.

The paving jobs handled by Peter Kiewit Sons' Co., Denver, were supplied by this Madsen 6,000-pound asphalt plant. Some 50,000 tons of hot-mix was needed for the work. Three sizes of aggregates go through the dryer and up the hot elevator to the gradation unit where they are separated before being mixed with asphalt.

Hot-mix paving operati

Paving operations on the 20-odd miles of service and access roads in the new Air Force Academy grounds at Colorado Springs turned out to be complicated when the job became engulfed in the rush of construction activities preceding the academy opening. The paving contractor, Peter Kiewit Sons' Co., Denver, was forced to pave short sections here and there in order to leave means of access for the hundreds of cars and trucks bringing workmen, materials, and equipment to the scattered building sites.

Two newly constructed interchanges on U. S. 85–87, which skirts the easterly edge of the sprawling 17,800-acre site, provide the only means of access to the area. A network of roads connects these interchanges with the several widely separated functional areas of the campus. With more than $127 million worth of work under contract and nearly 3,000 workmen entering and leaving the site every day, it was usually difficult to tie up more than a few short sections of road at a time for the base and paving operations.

The Kiewit firm was the successful bidder on five separate increments of the paving work on the site, as well as on a $1 million-plus street and underground-utilities job in the off-site Capehart housing area. The five paving contracts total about $2,650,000. All of the jobs were in progress at about the same time.

Work on a number of previous contracts had resulted in the completion of most of the grading and drainage, bridges, and curbs in advance of the paving. The relocation of U. S. 85–87 was completed in mid-1957 under a $2 million contract by Mountain States Construction Co., Denver. A number of bridges were constructed by A. S. Horner Construction Co., Denver, under a $4 million contract.

Road construction on the site was divided into three increments, with the work being shared by two contractors. The first and third increments were done by Nowers Construction Co., Pueblo, Colo., while the second was taken by Jack Adams and Haake Construction Co. of Santa Fe, N. Mex. These two each had about a million dollars' worth of work. Among the larger of the several other related contracts was one done by Kiewit in 1957—a $405,416 curb-and-gutter and paving job in the service-and-supply area.

Several roadway types

Depending on their planned usage, the roads within the academy site are divided into several classes with slightly different design standards. Some of the main roads have divided roadways with curbed or depressed medians. These and the other primary roads have 24-foot paved roadways with 10-foot-wide shoulders. Secondary roads are commonly 22 feet wide, with shoulders narrower

ercomes special problems at new Air Force Academy

Aggregate for the base course is produced at this blending plant. Kolman calibrated gates and reciprocating feeders deliver material to the 36-inch Kolman conveyor. Water is added in the Cedarapids pugmill at end of the conveyor.

than those of the primaries. In some housing and service areas, the roads are built to city-street standards.

Primary and secondary roads have 6 to 9 inches of compacted subbase and a 3-inch lift of base under the bituminous surfacing. On the primaries, the surfacing is 2½ inches thick. The secondaries usually have a 2-inch bituminous mat.

Kiewit's contracts called for the construction of 40,000 linear feet of 2-foot-wide curb and gutter in increment 2; 50,000 linear feet in increment 3; and 15,000 linear feet in the off-site housing area. There was also some preliminary grading and drainage that had to be completed in advance of the paving.

Base and subbase

Disintegrated granite for the subbase was produced in a pit north of Colorado Springs and about 14 miles from the job site. This material was dozed to a trap in the pit by Cat D8 tractor-dozers and conveyed to a Cedarapids Master Tandem portable crushing and screening unit. The finished material was stockpiled in the pit to be loaded as needed by tractor shovels.

Material trucked to the site and dumped on the grade was laid out by one of the Cat 12 motor graders on the job. After water was added by tank trucks, the material was compacted by an Essick vibrating roller and a Tampo self-propelled rubber-tire roller.

Material for the base course was a crushed limestone produced in a quarry northwest of Colorado Springs and about 12 miles' haul distance from the academy site. This rock was drilled and shot in the quarry and then dozed to the primary crusher. The output of the primary was conveyed to an impact breaker and then to a screening plant, which was arranged in closed circuit to return all plus ¾-inch rock to the breaker.

The screening plant turned out two sizes of finished material, which were stockpiled separately at the quarry. One of these was minus No. 4 material ranging down to dust; the other was graded from ¾-inch to No. 4. These materials were loaded into trucks by tractor shovels and hauled to a blending plant on the academy site.

At the blending plant, two small tractors—an International TD-9 and a Cat D4—dozed the respective stockpiles to separate traps, where recip-

For more facts, use Request Card at page 18 and circle No. 214

The blended and watered base material is loaded to a Barber-Greene laydown machine by a Ford truck. The paver lays a single course that compacts to the desired 3-inch thickness.

A pair of Cedarapids pavers work close together to obtain a hot joint as they lay down a single 2½-inch course for one of the main roads in the Air Force Academy grounds near Colorado Springs.

(*Continued from preceding page*)

rocating feeders and Kolman calibrated gates placed carefully controlled volumes of each size on a conveyor. This 36-inch Kolman conveyor powered by an International U-3[illegible] engine carried the materials out to a point over a truck-loading ramp. At the end of the conveyor, and operated by chain drive from the conveyor engine, was a small Cedarapids pugmill. As the materials fell from the end of the conveyor belt, water was added by a spraybar, and the materials were thoroughly mixed in the continuous pugmill before being discharged into waiting trucks.

Paver lays base

The blended and moistened base rock was trucked to the roadway under construction and placed by a Barber-Greene finisher. The paver laid down a single course, which would compact to the desired 3-inch thickness, and did the job without upsetting the uniformity of the blended material. Rolling followed immediately so that there was no loss of moisture by prolonged aeration.

Two rollers teamed up to compact the base. One was a Buffalo-Springfield 10 to 12-ton tandem steel-wheel roller, and the other was a Tampo self-propelled 9-wheel rubber-tire roller. Their combined efforts left the base in an unusually smooth and well compacted condition.

Before any traffic was permitted on the roadway, an Etnyre 1,360-gallon distributor, pulled by a Chevrolet truck, applied a prime coat of MC-0 or MC-1 cutback asphalt at a rate of 0.45 gallon per square yard. The asphaltic-concrete surfacing was laid directly on this prime without additional tack coat, except in cases where the prime got too dry or dusty.

Asphalt paving

To produce the 50,000 tons of asphaltic-concrete mix for the seven projects, Kiewit set up a Madsen asphalt plant near one corner of the academy grounds, adjacent to one of the U. S. 85–87 interchanges.

Three types of aggregates were trucked to the plant site and stockpiled over a recovery tunnel. The

Compaction is started by a Buffalo-Springfield 10 to 12-ton tandem roller. It is followed by a 9-wheel pneumatic roller, background. A motor grader is beginning to shape up the shoulders.

One of the important pieces of equipment on the job was this Miller Tilt-Top trailer pulled by a Ford truck. The trailer was often in use, for roads were being used constantly by contractors doing other work at the site and much of the paving had to be done in short sections.

tunnel was an oblong cattle-pass-type corrugated culvert, 70 feet long and more than 6 feet high. Inside the tunnel, slide gates equipped with Syntron vibrating feeders delivered proportioned volumes of the three aggregates to a Pioneer 24-inch conveyor. Another Pioneer 24-inch, 70-foot-long conveyor carried the material to the charging end of the plant dryer.

The three types of aggregates used in this mix were a fine pit-run sand, washed sand, and ¾-inch crushed rock. They went through the dryer together and then by hot elevator to the gradation unit at the top of the plant tower. Here, a separation by size was again made.

Asphalt cement was delivered to the plant by truck transports and stored in 20,000-gallon heated storage tanks. Heat for these tanks, as well as for the piping and plant units, was supplied by a Hi-Way hot-oil heater. Aggregates and asphalt were combined in the plant's pugmill to turn out the finished mix, which was hauled to the road in a fleet of Klewit's Chevrolet trucks augmented by hired trucks as necessary.

Two pavers lay mix

The asphaltic concrete was laid down on the roadways by a pair of Cedarapids bituminous pavers, which almost always operated close together in adjacent roadway lanes to obtain a hot joint. The pavers laid down material for the 2½ or 2-inch mats in a single course, the thickness depending on the classification of the roadway.

Immediately behind the laydown machines, a Buffalo-Springfield 10 to 12-ton tandem roller made the first compacting pass. A Tampo self-propelled 9-wheel rubber-tire roller followed, providing the kneading action to improve the density and tighten up the surface. Finally, a Buffalo-Springfield 3-wheel tandem ironed out the irregularities left in the surface by the other two rollers.

Except for the job complications, these base and paving operations might have been relatively routine and very fast. However, it was always necessary to arrange the work to permit a continuous flow of traffic to

(*Continued on next page*)

(Continued from preceding page)

all areas where other construction operations were in progress. Since this frequently meant moving from place to place at the completion of a short section of work, the mobility of the equipment was important. Rollers moved from place to place under their own power, but the pavers were hauled on a Miller Tilt-Top trailer pulled by one of the dump trucks.

Schedules of the work to be done on certain sections of road had to be prepared in advance so that traffic control could be set up on the necessary detours. Occasionally, traffic had to be carried through the work on the shoulders.

Personnel

Charged with the planning, scheduling, and supervision of the job operations for Peter Kiewit Sons' Co. on all of their contracts was area superintendent R. M. Turpen, who was assisted by superintendent J. K. "Red" Mann and assistant superintendent and project engineer John Briggs. Others on the staff were paving superintendent Roland R. Smith, base superintendent Ed Force, subbase superintendent D. "Sonny" Garrigus, hot-plant foreman Carl Winch, and field engineer C. O. Lindstrom. On the increment 2 work, Don Cox was superintendent; A. E. Allen handled the increment 3 contract.

Construction of the Air Force Academy is under the supervision of the Air Force Academy Construction Agency, with Col. Albert E. Stoltz as director and John P. Huebsch deputy director. Architect-engineer for the project is the Chicago firm of Skidmore, Owens & Merrill. Edward A. Merrill is director of engineering for the firm, and Carroll Tyler is general manager of the Academy project.

On the job, the construction engineer in charge of roads is James Beardsley. The assistant construction engineer is Leo Dolan. THE END

Experimental signs placed on Iowa highway

The Iowa State Highway Commission has installed 600 experimental "No Passing Zone" signs on U. S. 30 from Clinton to the Missouri River Bridge. The pennant-shaped signs are on the left side of the road to give motorists more sight distance when following and attempting to pass other vehicles.

Signs will point to the present yellow line mark in the center of the pavement. More signs will not be installed until their effectiveness can be determined under actual driving conditions.

U. S. Rubber news

Donald L. Reid has been appointed to the newly created post of regional sales manager of the West Coast branches by the mechanical goods division, U. S. Rubber Co., New York City. From Los Angeles headquarters, Reid will direct sales activities in 11 western states.

Tractor shovel handles five jobs at sewage-treatment plant

The entire pipe-laying job at the $550,000 sewage-treatment plant in Kendallville, Ind., is handled by a Trojan Model 154 tractor shovel. The Trojan unloads 24-inch corrugated pipe from gondolas, transports, and lays the pipe in the trench, and then backfills the trench.

The versatility of a rubber-tire tractor shovel enabled the C & C Construction Co., Fort Wayne, Ind., to proceed on schedule with the construction of a $550,000 sewage-treatment plant at Kendallville, Ind., despite three months of the most severe winter weather.

The tractor shovel, a Trojan Model 154, has been used to unload steel and pipe from boxcars, lay the pipe, load gravel, level fills, and pour concrete.

One of the toughest problems in laying the pipe is that the ground is muck for some 20 feet deep. It is so soft that bulldozers have sunk up to their hubcaps in just one pass. To remedy this, the tractor shovel loaded a fleet of six 10-yard trucks with gravel, which was used to buoy up the pipes. The Trojan filled each truck to capacity in five passes; at one 9½-hour stretch the rig loaded 1,050 yards of gravel.

By welding a hook to the bucket of the loader, the contractor has used the unit to replace a large crane for unloading both cast iron and corrugated pipe from railroad boxcars. The tractor shovel has also taken over the job of laying the 24-inch pipe in the trenches. It is able to lift two or three 1,000-pound pipes at once.

By using the Trojan for unloading pipe, the contractor eliminated the need for hiring a winch truck solely for the unloading operation. Although the winch truck can be used at a slightly lower cost, it is good for only that one job.

The tractor shovel has also proved to be handy for odd jobs that have cropped up during the course of construction. At one point, the dragline bucket of a crane had to be replaced. The Trojan transported the old bucket to the shop and returned with the new one, a much faster method than trucking it. THE END

Pakistan bridge to be one of world's longest steel arch spans

A new railroad bridge over the Rohri Channel of the Indus River, near Sukkur in West Pakistan, will be one of the longest steel arches in the world. The bridge will be a steel trussed arch having an 806-foot 9-inch span between end pins of the bottom rib. The rise of the bottom rib is 180 feet, and the distance between ribs at the crown is 24 feet, for a total height of 204 feet.

The bridge is designed to carry approximately E 55 loading on one broad-gage 5-foot 6-inch track. It will have a concrete deck, 15 feet wide between curbs and centered on the track center line, for use of Class 80 military vehicles in case of an emergency.

D. B. Steinman of New York City is the consulting engineer for the government of Pakistan.

The National Safety Council reports the traffic death rate hit an all-time low of 5.6 deaths per 100 million vehicle-miles in 1958. A death toll of 37,000 was the lowest since 1954.

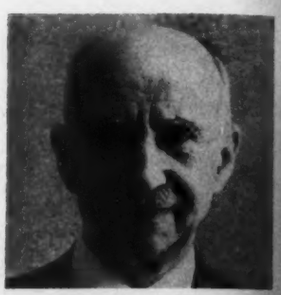
←For more facts, circle No. 217

Brazil to be host in September to Permanent International Association; world highway group, now 50 years old, has membership in 47 countries

International Road Congress prepares for Rio meeting

Well known abroad, though not so well known in this country, is the Permanent International Association of Road Congresses. This world body is now preparing for its XIth International Road Congress to be held in Rio de Janeiro, Brazil, September 21 through 26. The association was organized in France in 1908. At its initial congress, held in Paris, representatives from 33 countries attended.

A pattern of world-wide meetings every four years was followed, but World Wars I and II intervened to disrupt the congresses. No meetings were held from 1913 to 1923, and again from 1938 to 1951. In the latter year, the IXth Congress was conducted at Lisbon, Portugal. The last previous congress, the Xth, was held at Istanbul, Turkey, in 1955. Andre Rumpler, Director of Roads and Bridges in France, is president of the association with headquarters in Paris.



The president of the Permanent International Association of Road Congresses, Andre Rumpler, is France's Director of Roads and Bridges.

Equipment exhibit

The working sessions of the Rio congress will be divided into two main sections. The first covers the design, construction, and maintenance of roads and runways, while the second refers to roads in relation to traffic administration and finance. The Brazilian Organizing Committee is planning an exhibit of road-building equipment and materials to be held during the congress. For the week following the congress, an extensive excursion has been planned to the Sao Paulo and Belo Horizonte sections of Brazil.

Purpose of PIARC

According to its statutes, the general aim of the Permanent International Association of Road Congresses is "to foster progress in the construction, improvement, maintenance, use, and economic development of roads, and to encourage the growth of road systems throughout the world." At present, 47 countries are represented on the membership list of PIARC.

The United States was once a member, and the VIth Congress of PIARC was held in Washington in 1930. The late Thomas H. MacDonald, chief, U. S. Bureau of Public Roads, was general secretary of the congress at that meeting. After World War II, the U. S. government did not authorize the resumption of PIARC membership by the U. S. A. The reason advanced was that the U. S. A. could not belong to an association not completely incorporated in the United Nations organization, and that PIARC membership includes private individuals as members, as well as government representatives.

PIARC contended that while it

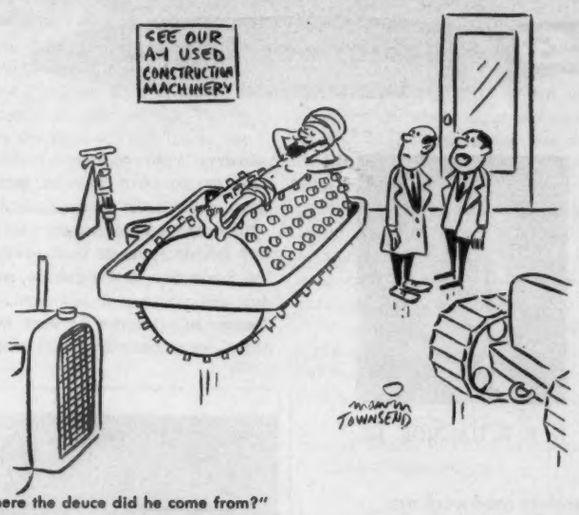
collaborated with the UN in a consultative capacity since the end of the war, it had at the time such active charter members as Switzerland and Spain which were not UN members. This would make it impossible for PIARC to be incorporated into the United Nations. Spain has since become a UN member.

With reference to the objection against private individual membership, PIARC feels that government delegates are not the only people who are qualified to solve technical problems. The congress declares that to solve such problems, close collaboration is needed between all engineers, including those engaged in construction as well as those working in laboratories. The PIARC aims to give technicians from all over the world an opportunity to meet and compare their work.

World-wide IRF

Another world-wide highway group, the International Road Federation, has national associates in 58 countries. Between the two organizations, 26 countries have membership in each. Brazil, for instance, is represented in both. Established in 1948, the IRF is a "nonprofit service organization to encourage the development and improvement of highways and highway transportation." Its headquarters are in Washington, and offices are also located in London and Paris. IRF held its third world meeting last October in Mexico City. In the United States, the IRF has the American Road Builders' Association as its national associate.

THE END



"Where the deuce did he come from?"

P&H marks anniversary with open house at plant

More than 2,400 people were guests at the Crystal Lake, Ill., diesel-engine plant of Harnischfeger Corp., Milwaukee, for an all-day open house in late February. This event was one of the celebrations marking the 75th anniversary of the company.

The firm conducted a tour of the plant's facilities for manufacturing heavy-duty diesel engines for industrial, automotive, and marine applications. Visitors were shown the construction of the engines from the initial castings to the fully tested unit. Many specialized machines used in the production of the engines were exhibited. Quality-control instruments were also demonstrated, as well as huge machines that drill 60 holes at a time in engine crankcases.

Engines built by the plant for national defense were also displayed, plus the complex equipment used for testing them.

Stanco forms company

Stanco Mfgs. & Sales, Inc., Santa Monica, Calif., has formed a separate corporation, Stanco Mid-West Sales, Inc., with headquarters in Chicago. The new firm will distribute Hiab hydraulic truck cranes, Flygt submersible electric dewatering pumps, and Pionjar rock drills and breakers through authorized dealers in the Midwest.

B. C. Ashoff has been named vice president of the new corporation.

Rumbler Stop successful

A new traffic control device, Rumbler Stop, has increased driver obedience to stop signs and lowered the accident rate along the Blue Star Memorial Highway in Maryland, according to a report from the Maryland State Road Commission.

Rumbler Stop consists of an asphaltic material containing particles of rough stone or slag. When a vehicle crosses the area, the driver receives a slight jolt, followed by a rocking motion and an audible rumble. This alerts him to the stop sign 300 feet ahead.

Surveying Washington

by E. E. HALMOS, JR.

Interstate road work up, but could move faster

Four sets of figures have to be put together before you can get a clear picture of progress of the interstate highway program.

The Bureau of Public Roads reported that, as of January 31, 1959, construction was under way on 3,552 miles of the Interstate System, at an estimated cost of $2.35 billion; on the ABC system (primary, secondary, and urban), since July, 1956, construction had been completed on 61,600 miles at a cost of $3.68 billion.

Commerce Secretary Strauss, reporting on the same programs, commented that "adequacy for 1958 traffic has been taken as a current criterion, since the objective has been to complete as much mileage on this basis as possible, adequate to meet current needs. . . ." On this basis, interstate roads meeting the current standards now total 4,831 miles, including 2,212 miles of toll facilities. Some improvement has been completed on an additional 2,665 miles, but further major improvements are necessary.

In another report, BPR said average bid prices for federal-aid highways during the past year showed a continuing, very slight, upward trend. But it virtually amounts to a stabilization, the rise being 1.2 per cent from the first to last quarter. The average number of bidders remained steady at about 7 per job, indicating an increase in bidders.

Finally, the American Road Builders' Association task force, putting the finishing touches on a mammoth report on contractor capacity, found that contractors in 1957 were working at 62 per cent of their estimated capacity, as against 46.4 per cent of capacity in 1954; the value of road construction was up over 45 per cent in the same period.

Road work is going up, but not as fast as money and mileage figures would indicate; there is ample capacity available to take a further expansion in work.

Need arguments on safety? Look at these figures

The AFL's Building Trades Department has compiled data on construction accidents for 1957, the last year in which complete figures are available. In that year, there were 2,600 lives lost in the construction industry; 5,600 accidents involving some degree of permanent impairment; and 191,800 lesser accidents.

Estimated cost of injuries totaled $112 million; indirect costs—such as lost production, investigations, selection and training of new men, and damage to machines or work being done—are estimated at $450 million.

Total loss to contractors for 1957 was at least $662 million; total loss to construction trades—difference between full pay and workmen's compensation—$250 million; and total loss to industry, $912 million.

More money for schools, housing and urban renewal

Construction money in two areas is now up for consideration in Congress. The areas are aid to education, and housing and urban renewal. They have to be called areas, since there are at least a dozen measures on these subjects before the Senate and the House.

The school proposal is for federal aid of $25 for each school-age child, beginning in July of this year and going up to $100 per child by 1962. The money would be used principally for construction of new classrooms or other facilities, and to help out with teachers' pay.

The Department of Health, Education and Welfare states that this year there are 33,936,470 children of school age—about 23 million of elementary-school age and 10 million of second-

ary-school age—in the continental United States. That would mean appropriations of over $849 million in the first year, mounting to about $3.4 billion by 1962.

Housing and urban renewal proposals would cost the federal government something like $5.8 billion, at 90 per cent federal contributions. Public housing would account for about $3.7 billion; urban renewal, about $2.1 billion. In addition, there is some $400 million in various bills for college housing, plus $100 million for financing housing for elderly persons.

At this point in the session, it would seem there will be new legislation in both areas, and it will call for increased spending. But it won't come near the top figures quoted. The Administration is making real headway with its pleas for economy. With 1960 in mind, few legislators really want to face a Presidential veto and the ensuing name-calling.

Construction labor makes Congress aware of needs

Some 3,000 representatives of construction labor deployed themselves by platoons and companies all over Capitol Hill for two days early in March to bring home to local members of Congress their demands for legislation at this session. The key points are that building trades don't want to be tarred with the brush Congress has been using on the Teamsters and juke-box groups; they do want Taft-Hartley amendments included in the Kennedy-Ervin bill (which would permit contracts on construction work before there are any workers on the site); and labor in general wants the minimum wage pushed up to $1.25 per hour.

In the general proposal to amend the Fair Labor Standards act, Paragraph "t," subsection 6 of HR 4579 contains this phrasing, under explanations of which employers are considered to be engaged in an activity affecting commerce: ". . . Any enterprise where such employer is engaged in the business of construction or reconstruction, or both, if the annual gross volume of sales of such enterprise is not less than $50,000."

Of course, few if any construction tradesmen are getting as little as $1.25 per hour. But many employers fear that a rise in the legal base rate will give rise to further demands for upping all wages, in order to maintain traditional differentials.

New fields for business in industrial construction

Industrial construction along the nation's waterways is a good place to look for new business. According to American Waterways Operators, Inc., 488 waterside industrial plants were built or expanded in 1958, as compared to 486 in 1957, despite the general downtrend in industrial construction last year.

And 1959 will see a sharp increase over that figure. AWO reported a jump in inquiries from industry to state development agencies, seeking information for possible new plant sites. Chemical and petroleum industries are expected to continue to lead.

Although the chemical industry looks for a drop in new construction, it figures there will be about $3.3 billion spent on new chemical plants in the three years 1958 through 1960.

The year 1958 was an all-around record breaker, says the Manufacturing Chemists Association. In that year, privately financed chemical production facilities were completed at a cost of $1.775 billion; the previous high of $1.3 billion was reached in 1957.

Trouble ahead for TVA and similar developments

Added curbs, if passed, will spell trouble for the Tennessee Valley Authority and for proposals to authorize a TVA-like authority for development of the Columbia River Basin.

What Republicans want, and what the White House apparently will back them in, is to force the TVA to pay current rates of interest on federal money invested in it; payment of the principal of government investments; a limit on the area into which TVA can expand its service; and controls on issuance of any TVA revenue bonds.

GOP Congressional leaders have long objected to the use of TVA prices as yardsticks for private power companies, on the grounds that TVA pays no interest on its money, pays "in lieu" payments instead of taxes, and can charge off some of its costs to recreation, fish and wildlife, and navigational accounts, where private companies cannot. Many have looked with alarm on TVA's steam-plant construction program as a means of extending the big agency's operations far beyond any original concept.

Conveyors cut rehandling of asphalt-mix aggregate

Aggregate rehandling was completely eliminated in a crusher and asphalt-plant setup used in paving 21.635 miles of interstate highway, presently numbered U.S. 85 and 87, between Pueblo and Fountain, Colo. A long conveyor carried the material from the crusher to a surge pile. A second conveyor, operating from a recovery tunnel under the surge pile, delivered the material right into the dryer of the plant.

The $1.7 million stabilization and asphalt-surfacing project was done by San Ore Construction Co., McPherson, Kans., under a contract with the Colorado Department of Highways. Grading, drainage, and structures had been completed previously under two separate contracts.

The design of the highway is the typical interstate section consisting of two roadways, each comprising two 12-foot-wide travel lanes, a 10-foot outside shoulder, and a 4-foot inside shoulder. The 60-foot-wide median between the roadways is depressed and will be sodded and landscaped. Service roads, built only where necessary, are 22 feet wide and are located near the right-of-way lines.

The typical section of roadway is built up from the grade with successive courses of subbase, base, and surfacing. The subbase course of minus 3-inch screened gravel ranges in depth from 9 to 16 inches. The base course is uniformly 4 inches thick and contains 2 per cent of cement. The first course of surfacing is 2 inches thick and 38 feet wide, and extends over the shoulders. The second course of surfacing is laid 1 inch thick and 24 feet wide for the two travel lanes.

The service roads have 6 inches of the subbase material and a 2-inch course of plant-mix surfacing. Minor drainage channels, which carry water

No rehandling of aggregates was needed at the asphalt-plant setup that turned out hot-mix for the 21-mile paving job on an interstate highway between Pueblo and Fountain, Colo. The minus ¾-inch aggregate produced by the Cedarapids Commander portable plant, left, rides a shop-built conveyor 180 feet to the surge pile. . . .

. . . The surge pile is built over a recovery tunnel made from an old railroad tank car. Another conveyor delivers the material directly to the Barber-Greene 838 oil-fired dryer. Limestone screenings are fed to the cold-elevator belt by the conveyor at right.

only during infrequent rains, are carried across the service roads by means of dips in the roads rather than with culverts. Barrier fences are erected between the service roads and the main roadways wherever necessary to keep vehicles from crossing.

The grading contracts, which were done by Schmidt Construction Co., Denver, and Smith & Lucas, Fountain, included the construction of junior interchanges at several local roads. These are box-culvert structures 16 feet wide, 14 feet high, and more than 120 feet long.

Subbase and base

Subbase and base aggregates were obtained from five pits spaced at convenient intervals along the project. A portable crushing and screening plant moved from pit to pit as the work progressed. In the pits, two or three Cat D8 tractor-dozers pushed the gravel to a trap feeding a 42-inch×50-foot Kolman conveyor with a 54-inch×9-foot screen attached. Material passing the 3-inch screen was used for subbase.

The oversize carried over on the screen fell into the receiving hopper of a Cedarapids Commander portable crushing plant where it was reduced to minus ¾ inch for the base course. This plant was powered by a Cat D337 engine.

The subbase was hauled to the road in Insley bottom-dump trailers carrying 16 to 20-ton loads and pulled by International trucks. The material was dumped in measured quantities to produce lifts of 4 inches or less. The material was watered when necessary, laid out by Cat 12 motor graders, and rolled by Ferguson 25-ton self-propelled pneumatic rollers.

Measured loads of the base aggregate were spread on the subbase by the same haul units. The 2 per cent of cement was added on the road directly from bulk-cement transport trucks. These materials were then thoroughly mixed by two Seaman Pulvi-Mixers, one self-propelled and one towed by a tractor.

During warm weather no water was added to this mix. During the cold weather, water was added to the mix from a 4,000-gallon semitrailer tank equipped with a Fairbanks-Morse pump powered by an International engine and pulled by a Diamond T

(*Continued on next page*)

Laydown operations move swiftly. The International truck, carrying an 18-ton load, feeds one of the two Barber-Greene finishers on the project. A third finisher was on hand as a spare. Following the Buffalo-Springfield 10-ton tandem roller on the first pass is a Buffalo-Springfield 3-wheel 12-ton tandem roller.

(*Continued from preceding page*)

truck. The 4-inch lift of base course was split into two windrows for mixing. After mixing, the windrows were laid out by motor graders, with the finishing being done almost entirely by one Cat No. 12 motor grader equipped with a Preco automatic blade control.

On parts of this alignment, the existing 18-foot-wide concrete pavement was left in place and incorporated into one of the new roadways. The roadway was widened to 24 feet, new stabilized shoulders were built, and a leveling course was applied over the roadway ahead of the regular asphaltic-concrete surfacing.

The finished base was primed with an application of 0.3 gallon per square yard of MC-1 or MC-O cutback asphalt laid down by an Etnyre 1,000-gallon distributor mounted on an International truck. No additional tack coats were used, except in a few cases where the base was covered with dirt because of its being used as a temporary roadway.

Conveyors feed plant

Since the project required the placing of some 200,000 tons of asphaltic-concrete surfacing, a high-production setup was a must. San Ore's big Barber-Greene Model 896 asphalt plant with its 6,000-pound-batch pugmill set a fast pace that kept the rest of the equipment busy.

The unique feature of the hot-mix plant setup was the continuous conveyor system, which delivered the aggregates from the crushing plant in the nearby pit directly into the dryer of the plant.

In the pit, a D8 with U-dozer fed the gravel to a trap supplying a primary jaw crusher. A short conveyor lifted the material into the receiving hopper of a Cedarapids Commander crushing plant where it was all reduced to minus ¾-inch size for the asphaltic concrete.

Coming out of the crushing plant, the aggregate was picked up on a 180-foot-long shop-built conveyor and carried to an intermediate surge pile built over a recovery tunnel. This tunnel was actually an old railroad tank-car tank with one end cut out. A feeder in the tunnel delivered aggregates to another somewhat shorter conveyor, serving as cold elevator, which carried the material right into the plant's Barber-Greene 838 dryer.

On the final surface course, limestone screenings were added to the mix. These screenings were stockpiled to one side and fed onto the cold-elevator belt by a conveyor set at right angles to the main feed conveyors. A D7 tractor-dozer usually worked this stockpile and fed the conveyor.

The supply of 120 to 150-penetration asphalt was received by tank car from Eldorado, Kans., and was heated and transferred to a truck transport by a Cleaver-Brooks retort heater. The 4,000-gallon transport trailer was pulled by an International L-190 truck. At the plant, a ramp was built up over the asphalt tanks so that the transport could drive over them. From a position on top of the tanks, the

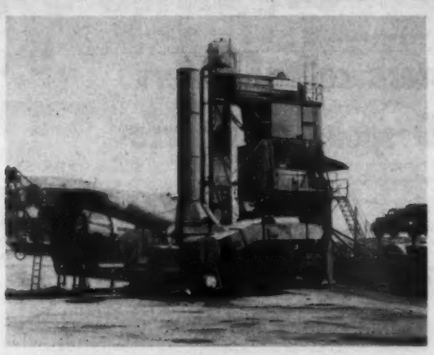
asphalt was transferred to storage by gravity.

To heat the 42,000-gallon asphalt storage and the piping systems, the contractor used a Hi-Way hot-oil heater.

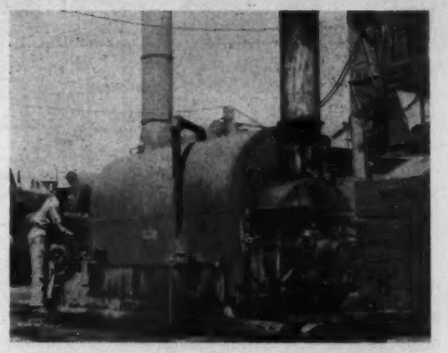
The big asphalt plant was powered electrically, but the dust collector was driven by an International 1091 engine. Two Caterpillar D337 diesel generating units supplied the electric power.

Use two pavers

A maximum of 11 big tandem-axle International trucks hauled the mix from the plant to the laydown crews, taking 18 tons of the mix per load. On the road, two Barber-Greene pavers laid the mix as fast as it was delivered. A third machine was kept on standby for emergencies. The pavers spread the 38-foot-wide first course in three passes and the 24-foot-wide second course in two.



The 200,000 tons of hot-mix for the job is turned out by this Barber-Greene 896 BatchOmatic plant with 6,000-pound-batch pugmill.



This Hi-Way hot-oil heater is used to heat the 42,000 gallons of asphalt storage as well as other units in the plant setup.

The mat was rolled first by a Buffalo-Springfield 10-ton tandem roller and then by a Buffalo-Springfield 12-ton 3-wheel tandem roller.

To give the shoulders an additional armor coat and a different color, crews applied a shot of RC-3 cutback asphalt at a rate of about 0.3 gallon per square yard, and ⅝-inch chips were spread on this surface at a rate of 20 pounds per square yard.

The chips were produced by the same Cedarapids Commander crushing plant that made the subbase and base materials. An Allis-Chalmers HD-6 Tracto-Shovel loaded the chips into trucks that hauled to the road. The trucks dumped into a Flaherty self-propelled spreader which laid the chips down in a uniform application over the width of the shoulder in a single pass. Rolling with a Galion 8 to 10-ton tandem roller completed this operation.

Personnel

The job for San Ore Construction Co. was run by a supervisory staff headed by superintendent Everett E. Davidson and including crushing and hauling superintendent Francis Ulrey, asphalt superintendent William Nuttall, and plant foreman Herman Rau.

The resident engineer for the Colorado Department of Highways was Van E. Williams, and the materials engineer was Kirk White. The work was handled through the Pueblo District office. J. A. Salmonson was district engineer; Walter Harris, assistant district engineer; and D. R. Mitchell, district construction engineer. W. A. Walsh is staff construction engineer, and Mark U. Watrous is chief engineer of the department.

THE END

Armco Drainage promotes

Frank M. Gray has been promoted to senior product engineer in the product engineering department of Armco Drainage & Metal Products, Inc., subsidiary of Armco Steel Corp., Middletown, Ohio. In his newly created post in the building-design section at Armco Drainage headquarters, Gray will be in charge of development design on three types of steel buildings.

Eastern college offers AED sponsored course

by CHARLES C. WING

"Bulldozers Put in College Course" was a headline used by a news service in the nation-wide announcement in November, 1957, that Clarkson College of Technology in Potsdam, N. Y., was offering its students courses in marketing construction machinery that will lead to a bachelor of science degree.

Three years ago, the board of directors of the Associated Equipment Distributors appointed an Education Committee to explore the idea of establishing such a course in some accredited college or colleges. It was felt that the growth of the construction-machinery industry has been so great in the last 15 or 20 years that there is an immediate need for a course designed to give the student basic knowledge of the industry.

Clarkson College, a privately endowed technological institution with an undergraduate body of 1,500, was founded in 1896 in the rural community of Potsdam, about 20 miles from the huge St. Lawrence Seaway and Power Development projects. Four years ago the school pioneered a course called Industrial Distribution.

College officials were approached by the AED committee, and they consented to set up a course in Construction Equipment Distribution. Accordingly, last spring, the AED board of directors voted $9,700 to be given to Clarkson College to develop this course. The funds were to cover the cost of textbooks, student-recruiting materials, visual aids, special library, teacher training, etc. The money was voted with the provision that three other colleges in the United States must show an interest in offering such a course. Three colleges—Western Michigan University, Texas A & M, and Bradley University at Peoria, Ill.—were visited last spring and agreed to set up the course after Clarkson piloted it.

(Mr. Wing is president of R. B. Wing & Son Corp., Albany, N. Y., and immediate past chairman of the Education Committee of the Associated Equipment Distributors.)

All the hurdles have been cleared, and the course has been formally approved and adopted at Clarkson.

Besides the three colleges mentioned above, Villanova University, the University of Illinois, and the University of Alabama have expressed interest in the new course and want to be advised of its progress.

Dr. William G. Van Note, Clarkson president, in announcing the new course stated: "This new program is an outstanding example of the beneficial cooperation between industry and education in meeting challenges."

THE END

Yale & Towne divisions appoint distributors

The Trojan Division, Yale & Towne Mfg. Co., Batavia, N. Y., has appointed two new distributors to handle its tractor-shovel line. Moody Equipment & Supply Co., 8820 New Benton Highway, Little Rock, Ark., will cover all but nine counties in that state. Cook Bros. Truck & Equipment Co., Construction Equipment Division, 7101 San Leandro St., Oakland, Calif., will serve the northern part of California.

Yale & Towne's Yale Materials Handling Division, Philadelphia, has named Lakeshore Materials Handling Co., division of Lakeshore Machinery & Supply Co., an exclusive franchised representative for Yale industrial lift trucks and tractor shovels

COMPARE before you BUY
...then you'll buy LITTLEFORD

only part of the exciting Master story.

THREE OUTSTANDING ADVANTAGES:

1. Single lever control
. . . not four confusing levers, but one easily operated capstan-type hand wheel. Controls spraying, tank circulation, transfer and drain.

2. Heat chamber
. . . contains pump, valve and piping which are heated in the chamber by one low pressure burner—no auxiliary burners are required. Pump is far more accessible for servicing than any other unit because it is mounted on the rear head.

3. Multi-pass continuous heat flue
. . . fast, full heat from just one low-pressure burner that heats at low stack temperatures. No sludge or carbon deposits in flue. Furnished as standard equipment on sizes 800 thru 1250 gallon.

4. Unobstructed operator's view
. . . no part of the spray bar is hidden by overhanging obstructions. On-the-spot adjustments can be made before the distributor has traveled any great distance.

5. "Lite-Wate" full area spray bar
. . . gives full flow of hot material throughout spray bar at high pump speeds. Bar heats to spraying temperature faster than any other unit, saves 5 minutes on every load.

Profits are gauged by the amount of work done and how much it costs you to do the work. The Littleford Spray Master Bituminous Distributor has been engineered and designed for extreme ease of operation and low maintenance. No other machine contains so many *profit saving features* or is so well constructed as the Littleford Spray Master.

Compare *ANY* bituminous distributor with a Littleford Spray Master and you'll agree . . . the Spray Master dollar for dollar is your best buy.

For detailed information on the Littleford Spray Master simply return the postage paid air mail reply card at the bottom of this page.

LITTLEFORD BROS., INC. • 457 EAST PEARL STREET • CINCINNATI 2, OHIO

- ☐ SPRAY-MASTER—Please send me at once—complete information on Littleford's Spray Master Bituminous Distributor—Bulletin 14.
- ☐ SPRAY LEADER—Bulletin 30 describing the Spray Leader Model "D" as shown on the next page.
- ☐ SPRAY CHIEF—Bulletin 38 describing the Model "E" Spray Chief Maintenance Distributor as shown on next page.

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

INDIVIDUAL_____ TITLE_____

OFFICES IN CINCINNATI, OHIO AND ALBANY, NEW YORK

in western Michigan. Lakeshore Materials Handling has its headquarters at 3057 Madison Ave. S. E., Grand Rapids, and maintains a branch at 400 W. Laketon Ave., Muskegon.

The division also named Neff Machinery, Inc., an exclusive franchise representative for its industrial lift trucks and tractor shovels in southern Florida. The dealer has headquarters at 2601 N. W. Fifth Ave., Miami, and a branch at 4115 Georgia Ave., West Palm Beach.

P&H division honors four equipment dealers

Two domestic and two overseas equipment dealer organizations were honored at the 40th annual national sales banquet of the Construction and Mining Division, Harnischfeger Corp., Milwaukee. Plaques, in recognition for highest total sales of P&H power cranes and shovels in 1958, were presented to Gleason Equipment Co., Chicago; Construction Equipment Corp., Long Island City, N. Y.; L. Angelopoulos-N. Koutrouflotis, Athens, Greece; and Compania Distribuidora Nacional, Santiago, Chile.

Two Worthington dealers

Worthington Corp., Harrison, N. J., has appointed Equipment Service Co. of Pecos, 1501 W. Second St., Pecos, Texas, to handle its mixers and contractors' pumps throughout the state.

Tri-County Contractors Supply Co., Inc., 1702 Riverdale St., West Springfield, Mass., will cover five counties in that state. The dealer will carry mixers, contractors' pumps and tools, pneumatic placers, pavers, portable rotary compressors, and mobile drills.

Thor dealer moves

Pearson Equipment Co.—distributor for the Construction Equipment Division, Thor Power Tool Co., Aurora, Ill.—has moved to new headquarters at Reedsdale and Belmont Streets in Pittsburgh. The dealer, which serves southwestern Pennsylvania, was formerly located at 914 E. Ohio St.

New Kwik-Mix dealer

Ensminger & Co., Inc., S. Franklin and West Sts., Wilkes-Barre, Pa., has been appointed a distributor for the Moto-Bug line of material handlers produced by the Kwik-Mix Co., division of Koehring Co., Port Washington, Wis. The dealer will cover 18 northern Pennsylvania counties.

New Parker Seal dealer

Robert B. Porter Co., 1804 Chiquita Place, Glendale, Calif., has been named a distributor for industrial Gask-O-Seals and Stat-O-Seals produced by the Parker Seal Co., a division of Parker-Hannifin Corp., Culver City, Calif. The dealer also has a northern California branch at Hayward Municipal Airport, Hayward, which will serve the San Francisco Bay area.

New dealers for Clark

McAllister Equipment Co., 1615 N. Mannheim Road, Melrose Park, Ill., has been appointed to sell and service Michigan tractor shovels, dozers, scrapers, and excavator cranes produced by the Construction Machinery Division, Clark Equipment Co., Benton Harbor, Mich. McAllister will handle seven Illinois counties and two Indiana counties.

Allied Equipment Corp., No. 1 Glass St., P. O. Box 490, Carnegie, Pa., will serve the Pennsylvania counties west of and including Potter, Clinton, Centre, Huntingdon, and Fulton; three Ohio counties; two Maryland counties; and four West Virginia counties.

Wright-Thomas Equipment Co., Inc., 5528 MacCorkle Ave. S. E. Charleston, W. Va., will cover all but seven counties in that state.

Road Machinery & Supplies Co., 4901 W. 78th St. (Highway 100), Minneapolis, will handle all southern Minnesota counties.

Canadian dealer for B-E

Street-Robbins-Morrow, Ltd., Calgary, Wetaskiwin, and Lethbridge, Alta., Canada, has been appointed a distributor for the Bucyrus-Erie Co., South Milwaukee, Wis., and its Canadian subsidiary, Bucyrus-Erie Co. of Canada, Ltd., Guelph, Ont. The dealer will offer sales and service on excavators, cranes, transit machines, Hydrocranes, Hydrohoes, Hydroshovels, dragline buckets, electric shovels, walking draglines, cable tool and rotary blast-hole drills, bit dressers, and railway cranes.

Western Machinery names staff, dealers

Warren J. Sullivan has joined the Industrial Sales Division, Western Machinery Co., San Francisco. He will be field sales manager of the Phoenix, Ariz., branch. R. B. George, new operations manager for the Arizona branches, will have headquarters in Phoenix and will also supervise the Tucson office. George replaces Jack Keller, who has been named assistant to the general manager of the division.

Six new distributors have been

(*Continued on page 39*)

NOW Atlas publishes an authoritative manual on electric blasting

Describes techniques to minimize cut-offs, reduce noise, control throw, improve breakage

Sure, it takes skill to blast electrically! You have to figure resistances of electric blasting caps, leg wires, connecting and leading wires . . . know what current will fire how many caps . . . what circuits would do the job best. There's a lot more to it than just tying square knots! But when you have the answers to these and other factors, *all covered in the new Atlas Handbook*, look at the advantages you get:

- **Initiation at the point that puts the full explosive force to work**
- **Dependable split-second timing in each charge before the rock begins to move**
- **Better control of throw • Minimum noise and vibration**

The pay-off is in more complete breakage, quicker, safer digging, reduced crushing and maintenance costs, better public relations. Write now for your copy of the new Atlas "*Handbook of Electric Blasting*." Discuss the methods it describes with your Atlas representative. He has a whole kit full of ways to help lower your blasting costs and get better breakage.

Ask your Atlas representative to show you the electric blasting cap match demonstration. See why Atlas E.B. caps lead the field in dependable performance.

EXPLOSIVES DIVISION

ATLAS POWDER COMPANY

WILMINGTON 99, DELAWARE

Offices in principal cities

For more facts, use Request Card at page 18 and circle No. 230

(Continued from page 37)

named to handle the line of aggregate-processing equipment manufactured by the company's WEMCO Division. Edward R. Bacon Co., San Francisco, will cover northern California and western Nevada; Plains Machinery Co., Amarillo, will serve western Texas and the Texas Panhandle; Contractor's Machinery Co., San Antonio, will handle southeast Texas.

Northern Illinois has been assigned to A. H. Puffer & Co., Rockford; Ohio to Gibson-Stewart Co., Cleveland; and western Pennsylvania and the Panhandle of West Virginia to Watson Equipment Inc., Pittsburgh.

Yale & Towne dealer moves, names manager

Richmond Materials Handling Co. has moved to a 2,500-square-foot sales and service center at 2303 Westwood Ave., Richmond, Va. The dealer also appointed Terry A. Hurlbut, Jr., general manager.

The firm is a franchise sales and service representative for industrial lift trucks and tractor shovels produced by Yale & Towne Mfg. Co., Philadelphia.

Metalweld division change

The Construction Equipment Division of Metalweld, Inc., Philadelphia, has changed its name to M-W Equipment Co. The division handles industrial and construction machinery in eastern Pennsylvania, southern New Jersey, and Delaware.

Frank Paparone has been promoted to shop superintendent of M-W Equipment Co. He will work with service manager John Sardarian directing mechanics in the repair and rebuilding of all types of heavy-construction machinery.

Koehring, Parsons hold regional sales meetings

Five regional sales meetings for distributors have been held by the Koehring and Parsons Divisions of Koehring Co., Milwaukee. The highlight of the 2-day conferences was field reports on new Koehring models introduced last year: the Skooper loader; the Model 545 Sprawler crane; the Dumptor, a 10-yard off-the-road hauler; the firm's one-man-operated Cruiser crane; two truck cranes; and a transverse finisher. Data was presented on a Parsons wheel and three ladder-type Trenchliner models.

State Equipment appoints

Bob Fitzgerald has joined State Equipment Co., Harrisburg, Pa., as a sales representative for Huntington, Mifflin, Union, and Juniata counties. He will handle construction-equipment sales of International Harvester, Hough, Drott, and related lines.

Griffin Equipment news

The name of the Lodi, N. J., branch of Griffin Equipment Corp. has been changed to Engines & Power, Inc. The branch is a wholly owned subsidiary of Griffin Equipment Corp., New York City. The new name more aptly describes the business conducted by the branch.

Schramm names Battalion

J. M. Battalion Co., 330 Poquonock Ave., Windsor, Conn., has been appointed by Schramm, Inc., West Chester, Pa., to carry its line of portable and stationary compressors, Pneumatractor self-propelled air compressors, and construction tools. The dealer will cover the entire state.

are you still buying

tractor-shovels...

it's not the size of the bucket but the weight of the load you can carry that determines shovel capacity

Take a good look at shovel "capacity" before you buy. You will find tractor-shovels being sold by lifting capacity, by bucket size and by carry capacity. Which is the most accurate means of measuring and comparing tractor-shovel ratings?

Why You Can't Measure By Lifting Capacity

Lifting capacity is merely the maximum number of pounds a tractor-shovel can raise from the ground WHILE STANDING STILL. It does not take travel or movement stability into consideration. It is primarily a measurement of the hydraulic system . . . yet some tractor-shovels are rated and compared on this basis.

Why You Can't Measure By Bucket Size

Rating a tractor-shovel by bucket size is a carry-over from rating power-shovels by the yard. However, a tractor-shovel does more than just LOAD, it MOVES material from one point to another and so there are other factors involved.

Bucket size gives you the cubic content capacity of the bucket itself. But what you put in the bucket is even more important. The stability and safe TRAVEL of a unit with a 2 yd. load of dry clay is a lot different than with a 2 yd. load of fire clay. One load weighs 3,700 lbs., the other, 7,000 lbs.

Why Carry Capacity Is the Most Accurate Rating

Since a tractor-shovel is a mobile unit, the governing factor in its capacity is the number of pounds it can safely carry WHILE TRAVELING, without abuse or excessive maintenance. The weight of the material then determines the size of the proper bucket.

This is why all "PAYLOADER" machines are rated by the number of pounds they can safely and continuously carry. The following table, taken from our standard specification sheet illustrates the ratings on the Model H-90 "PAYLOADER" with 9,000 lbs. carry capacity.

Material Weight Lbs./Cu. Yd.	Bucket Capacity SAE Rated	Machine "CARRY" Capacity
up to 1,800	5 cu. yd.	9,000 lb.
up to 2,250	4 cu. yd.	9,000 lb.
up to 3,000	3 cu. yd.	9,000 lb.
up to 4,500	2 cu. yd.	9,000 lb.
up to 6,000	1½ cu. yd.	9,000 lb.

Doesn't this make more sense than calling it a 2 yd. or 3 yd. or 5 yd. machine?

Before you buy any tractor-shovel, be certain you compare CARRY CAPACITIES, in pounds, and not lifting capacity or bucket size, if you want to get the most for your equipment dollar.

THE FRANK G. HOUGH CO.
702 Sunnyside Ave., Libertyville, Ill.

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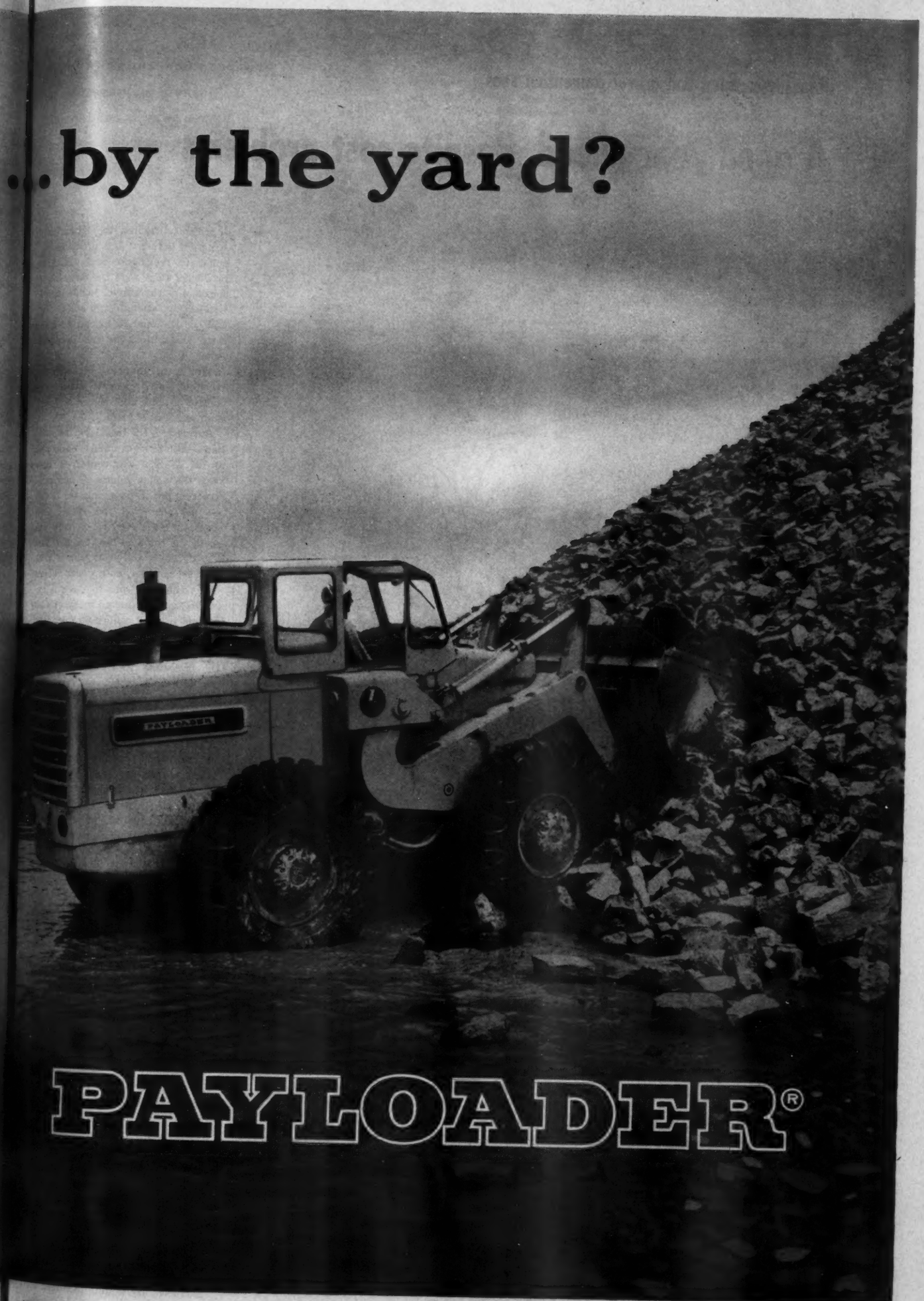
SUBSIDIARY — INTERNATIONAL HARVESTER COMPANY

For more facts, use coupon or Request Card at page 18 and circle No. 232


s...by the yard?
PAYLOADER
PAYLOADER®

Ready-mix, sand and gravel convention sees

A good year ahead, despite cost problems

Problems plaguing the entire construction industry and problems peculiar to ready-mix and aggregate producers alone were the concerns of speakers at the annual joint convention of the National Sand and Gravel and the National Ready Mixed Concrete associations in the Roosevelt Hotel in New Orleans. The subjects ranged from financing problems for the interstate highway program to control of noise and dust at a typical sand and gravel plant.

But despite the problems, members had reason to be cautiously optimistic as far as 1959 was concerned. Last year, the dollar volume of new construction put in place was $49 billion—2 per cent over the $48.1 billion spent in 1957. Physical volume was about the same as that for 1957 and slightly below the peak year of 1956. In 1959, however, both dollar volume and volume of work in place is expected to reach record marks. Dollar volume, it is felt, will go up 7 per cent, reaching a new high of $52 billion and passing the $50 billion mark for the first time. And volume of work put in place is expected to exceed the 1955 record, by some 3 per cent.

Plant expansion in '59

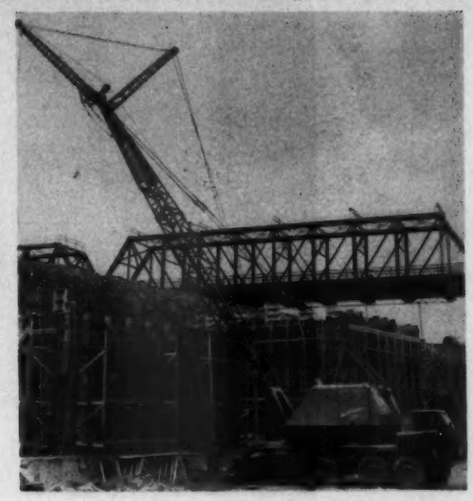
The tone of the convention was set by the paper presented by William Moore, president of J. P. O'Connell Co., Boston, Mass.; it dealt with the market for both sand and gravel and ready-mix concrete in the coming year. Moore's conclusions were based on a questionnaire answered by a representative sampling of member companies throughout the country. Answers showed a variation from region to region, but in general, firms expected to register an improvement over 1958, or at least to hold the line on business. Backing up this trend is the fact that many producers are building new sand and gravel plants, while others intend to expand or rehabilitate existing plants and buy such new equipment as screens, conveyors, and cranes.

Ready-mix concrete producers planning new plants are not confined to any region; they blanket the country. As with sand-and-gravel producers, ready-mix operators are planning a fairly large expansion in 1959; rehabilitation of existing plants and purchasing of trucks and truck mixers head the list.

Costs squeezing profits

The chief problems facing producers, according to Moore, fall into three categories. Sand-and-gravel producers are finding increased costs

Many operators plan expansion or improvement in facilities; rising labor price expected to increase squeeze on profits



ROUND-THE-CLOCK concrete placement for locks at the downstream entrance of the St. Lawrence Seaway is done by a Manitowoc Model 2800 mobile crane. The 40-ton crane swings 2-yard buckets from shuttle trucks to forms. The crane also set forms and lifted girders into place.

of labor the principal problem. These costs cannot be reflected in increased prices because of competitive forces. Lack of cost knowledge and inability to control costs came next in that order as top problems for the aggregate men.

Ready-mix operators cited the same problems but changed the order: uneconomic expansion of ready-mix facilities was cited as the biggest problem; steadily increasing labor costs came next; and lack of cost knowledge and inability to control costs were listed in third place.

The cost problem permeated the convention. In the several sessions, ready-mix and sand-and-gravel delegates heard reports on operating cost ratios, depreciation and salvage values for tax purposes, cost controls for truck and plant maintenance, cost investigations on wire cloth and punched plate for vibrating screens.

Labor costs going higher

In one area vitally affecting costs—the price of labor—Vincent P. Ahearn, executive secretary for the joint association, held out little hope for delegates. In his talk, "An Appraisal of the Results of Industry Bargaining with Labor Unions in 1958 and Danger Signs for 1959," Ahearn stated that "labor peace in the industry was bought at a bitter price in 1958." Members of both industries who signed labor agreements last year, he said, increased their labor costs about 6 per cent. And wage increases accounted for only part of the total, he pointed out; more paid holidays, more liberal vacation allowances, shift differentials, guaranteed workweeks, new pension and welfare programs, and increased payments for established programs contributed to the rise that ranged between 18 and 8 cents.

As for 1959, Ahearn saw little hope of reversing the trend. Unions will ask for—and get—more increases, he stated; the only hope for producers will be to hold increases to a minimum so that operating costs will register only slight increases.

Elected as chairman of the Manufacturers Division of the National Sand and Gravel Association for the coming year was W. A. Rundquist, Pioneer Engineering Division of Poor & Co., Minneapolis. Vice chairmen elected include Emil Deister, Jr., Deister Machine Co., Fort Wayne, Ind.; John E. Dunn, Allis-Chalmers Mfg. Co., Milwaukee; Ralph B. Utt, Western Machinery Co., San Francisco; and John E. Steffens, Ludlow-Saylor Wire Cloth Co., St. Louis, Mo.

THE END

A tieback system supports the arch truss during steel erection for Glen Canyon Bridge. Strands of Bethlehem 1½-inch steel run from high towers on both banks to panel points on the arch.

Highest

The pendant or tieback cables are attached to the chord points of the truss. The double strongbacks on the rods between the cables and the truss are the devices that provide for tensioning the cables to adjust the horizontal and vertical position of the suspended steel.

A field connection is made after one of the top chord members of the arch truss has been set in place. All connections in the arch were riveted. High-tensile bolts were used for field connections in the deck structure.

A dynamite blast is set off by workers at the dam site as the last top chord member is eased into place, marking the closure of the arch-truss bridge.

The arch completed, the cableways work to set columns that will support the deck girders. A big 25-ton cableway, and the 12.5-ton line used to transport men and materials across the canyon since the start of the job, teamed for this work. Excavations in the banks are for the dam spillways.

The 25-ton cableway holds one of the long columns at the middle while the smaller cableway takes hold of the bottom end. The big line then moves up to handle the top, and both lines swing the post out over the canyon.

At the point where the post is to be [illegible] the bottom of the column is lowered. [illegible] lease of the small cable allows the [illegible] to be positioned.

ghesteel arch bridge completed at Glen Canyon

Cable tiebacks support arch truss during erection, permitting precise positioning of steel for closure

by RALPH MONSON, field editor

Glen Canyon Bridge, the highest and second-longest arch bridge in the country, is open and carrying traffic across the quarter mile of 700-foot-deep canyon, giving construction forces a big advantage in their work on Glen Canyon Dam.

Prior to the opening of the bridge on February 20, cableways and a footbridge were the only means of crossing the canyon. And when project superintendent W. A. "Bill" Choate arrived at the site in March, 1957, the only means of getting from one side of the canyon to the other were by airplane or a rugged 200-mile road trip. (For a detailed account of the early stages of construction, see "Bridge Skewbacks Built into Vertical Walls of Glen Canyon," C&E, December, 1957, page 56.)

The bridge, designed by the Bureau of Reclamation as an adjunct to Glen Canyon Dam, was built under a $4,139,277 contract by Kiewit-Judson Pacific Murphy, a joint venture of Peter Kiewit Sons' Co., Omaha, and Judson Pacific Murphy Corp., Emeryville, Calif. It spans 1,028 feet across the canyon at a location 865 feet downstream from the dam center line. From its deck, 700 feet above the Colorado River, travelers will get a dramatic view of the dam and reservoir. The bridge, a link in the new alignment of U. S. 89, ties together two segments of newly constructed highway leading to the site.

Tiebacks support steel

Probably the outstanding feature in the construction of the bridge was the pendant or tieback system used to support the arch truss during erection. Bridge strands of 1½-inch Bethlehem steel, extending from the tops of high towers on either bank to selected panel points of the arch, supported the tons of steelwork being assembled piece by piece over the canyon. Big hydraulic jacks in tensioning devices at the outer ends of the tiebacks permitted adjustment of the tension in the cables to equalize stresses between the cables and to permit precise positioning, both vertically and horizontally, of the ends of the trusses as the two halves were joined in the middle.

More of these strands guyed the tops of the tieback towers to huge concrete deadmen cast into the solid rock of the canyon banks.

Prior to the start of erection of the steel, two cableways had been built across the canyon to serve the bridge construction. The first high line, which had a capacity of 12.5 tons (with a five to one safety factor), was built as one of the very early phases of the project. For some time, it was the only means of transportation across the canyon and was used to carry many loads of passengers, supplies, and materials from one side to the other. In the steel erection operation, it served to transport men, tools, and equipment from either bank out onto the structure, and occasionally it joined its larger partner in handling a long piece of steel. This line was located 30 feet upstream from the bridge center line.

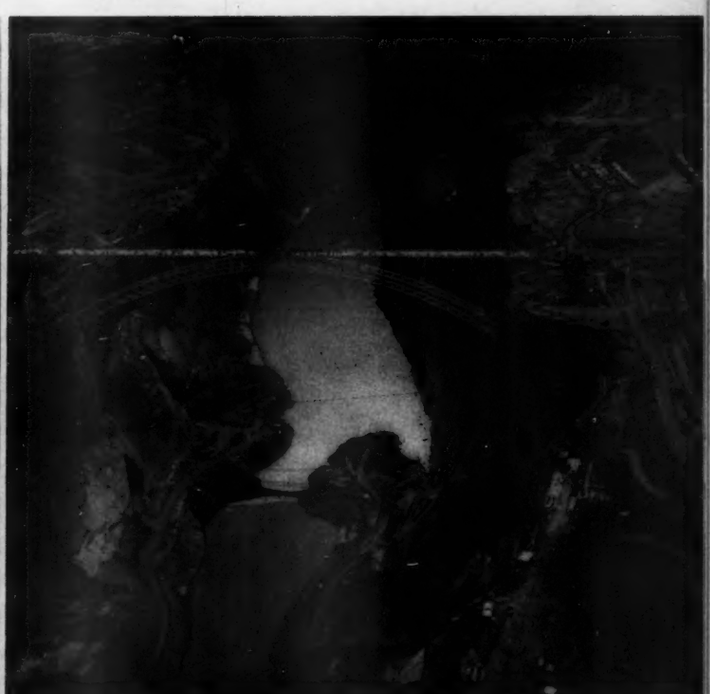
On the bridge center line, K-JPM set a 25-ton cableway to handle the steel. This rig had a 165-foot-high head tower on the left bank and a 150-foot-high tail tower on the right bank. The tops of the two towers were at the same elevation. Both of these towers could be luffed (tilted) either right or left to bring the cableway out a maximum of 20 feet either side of center line. This placed the carrier directly over the chords of the truss. Two Skagit 2-drum hoists powered by Hercules gasoline engines controlled the luffing, while limit pinnets prevented the towers from tilting more than the 20 feet.

The main track or "gut line" of the big cableway was a Roebling 3-inch strand 1,540 feet long. Traction and

(*Continued on page 47*)

Workmen juggle the bottom of the column into position atop the chord of the truss and bolt it down. Guy lines tied out in several directions hold the column upright.

As the steelwork advances, the big cableway is used to bring out the deck stringers. Columns farthest out are guyed to the bank, as well as ahead to the arch truss.

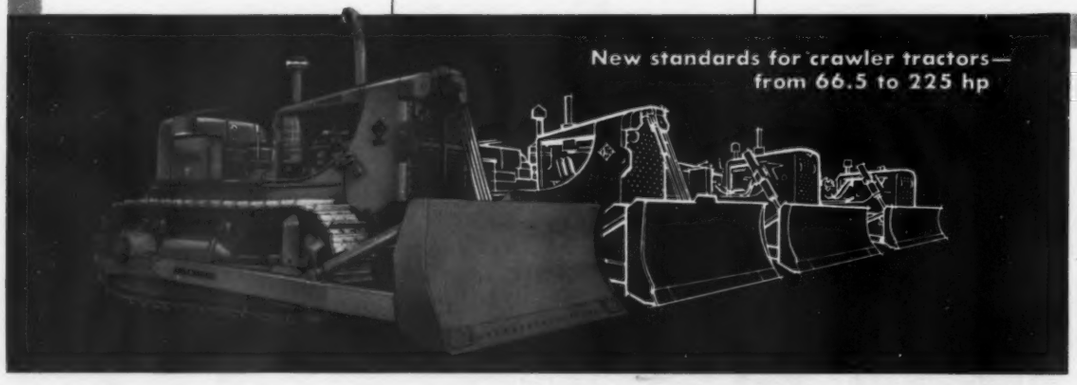


Crowds jam the Glen Canyon Bridge at its dedication. Paving took about a month. Aside from providing a vital road link between Utah and Arizona areas, the span will play an important role in getting equipment to the site for construction of the dam. (*USBR Photo*)

How to get more tractor for your dollar

In the chart below are five important crawler tractor advantages. These features have earned recognition by all makers of crawler tractors—one or more are now included in their latest designs. It stands to reason that the more of them you get on your next crawler, the more it is worth to you.

Advantage	What it means to you	Where you get it
All-steel main frames	Power train protection Better equipment mounting Better weight distribution	Allis-Chalmers is the only manufacturer offering main frames in *all* models. Two other manufacturers now offer them in one model.
Permanent lubrication of truck wheels, idlers and support rollers	No more wasted time greasing these track components	Allis-Chalmers is the only manufacturer offering permanent lubrication of truck wheels, idlers and support rollers on *all* models. One other manufacturer offers permanent lubrication on three models.
Torque converter drive	Matches power to load automatically Transmits power smoothly Less shifting	Allis-Chalmers pioneered it in crawler tractors in 1940 . . . offers it in two tractor shovel models, two tractor models. All other major manufacturers now offer it as optional equipment in one or more models.
Double reduction final drives	More clearance Longer gear life	Allis-Chalmers is the only manufacturer offering double reduction final drives on *all* models. One other manufacturer offers it on three models.
True unit construction	Faster service Easier access to all major assemblies	Allis-Chalmers is the only manufacturer offering true unit construction in *all* its models. Two other manufacturers now offer modified unit construction in part of their lines.



Here's proof that other manufacturers of crawler tractors have chosen to "follow the leader" with Allis-Chalmers engineering . . . and that your Allis-Chalmers dealer is the man to see for top value in crawler tractors.

He'll be glad to demonstrate the model of your choice. It will have more industry-approved advantages than any other unit near its size. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

move ahead with ALLIS-CHALMERS

...power for a growing world

For more facts, use Request Card at page 18 and circle No. 235

(Continued from page 45)

load lines were 1¼ inches and ⅞ inch, respectively. The cableway was operated by a 2-drum Lidgerwood hoist powered by a Waukesha diesel engine with a Twin Disc torque converter.

As the column rides out over the arch, the towers of the big cableway are luffed to the left so that the gut line lies over the truss-chord position. Lines can be luffed 20 feet to either side; the small cableway has no side movement.

The heaviest single piece of steel to be set by the cableway was a 30-ton box section for one of the chords. To handle this load with the 25-ton cableway meant making a few adjustments. Actually, the 25-ton rating was based on a 6 per cent sag in the gut line. By sagging the line to 7½ per cent, the contractor increased the safe capacity to more than 30 tons. (The safety factor was still at least 3.) Since the back anchors had been designed for this extra load, there was no question of their sufficiency.

When the lighter deck members of the bridge were set, the gut was tightened to give added headroom and to ease travel.

Steel gets long ride

Steel for the structure was fabricated by JPM at Emeryville, Calif., and shipped by rail to Flagstaff, Ariz., the nearest railhead to the job site. At Flagstaff, the Santa Fe Railway installed a 75-ton overhead bridge crane (sold to them by Judson Pacific Murphy Corp.) to transfer the 4,000 tons of steel directly from rail cars to trucks. Belyea Trucking Co., Los Angeles, trucked the steel 110 miles to Page on the east bank of the canyon at the bridge site. Here, a Lorain 30-ton Moto-Crane unloaded and yarded the sections. Since most of the heavy pieces were the box sections of the arch-truss chords, they stacked well on the trucks and made neat, full loads.

At the start, a D8 tractor was used to pull the trailer that delivered the steel from the yard to the cableway. Later, the road was improved, and a truck relieved the tractor.

Erection by cableway

All of the steel was set by the big cableway. This eliminated the need

(Continued on next page)

Workmen prepare to set another section of the bridge, which is being lowered into place by the big cableway. The cage, suspended from the smaller cableway, was used to transport workmen, tools, and supplies. Since erection was done from overhead, it was never necessary for men to work ahead of the safety net that was hung from the steelwork.

Superstructure steelwork nears completion for the bridge, which spans 1,028 feet across the gorge and has a deck 700 feet above the canyon floor. The first columns on each truss are 157 feet long and weigh 28.5 tons each. Here, the small cableway is carrying workmen and supplies out onto the structure while the big line brings a column to steel crews.

Tiebacks support arch

Erection of the arch steel began with the setting of the first lower chord members on each side. These were attached to the concrete skewbacks with 16-inch pins. The outer ends were supported by pairs of tieback lines from the tops of the towers.

The trusses were then assembled out to the second panel point, where tieback lines were again attached to the lower chord. This freed the first tiebacks, and the arch hung from the second set while steel was erected out to the fourth panel point. Four tieback cables were then attached to the top chord at the third panel point. From this time on, all the tiebacks were attached to the top chords.

At the fifth panel point, six tieback lines were attached to each chord. There were no cables at panel

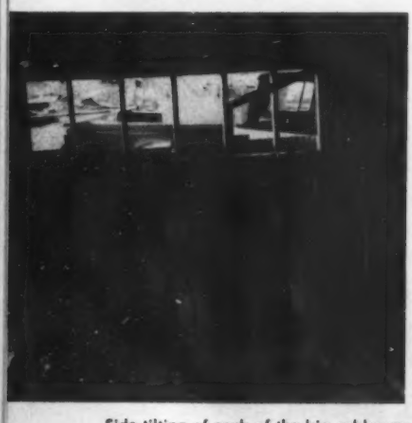
(*Continued from preceding page*)

for a traveler on the truss and greatly lessened the load on the tiebacks. Another advantage of the erection by the overhead cableway was that the safety net could be kept ahead of the work at all times so that workmen never had to work without the net under them.

Erection of the arch truss was carried on by one crew working alternately from both sides of the canyon. In this way, the two halves were completed to the center at about the same time.

Before starting to set the truss steel, the contractor had to prepare the tieback towers on each side. The towers were fabricated from steel sections that were to be used for the deck of the bridge after the arch was completed. The vertical members were the bridge columns, and the horizontal members were the floor beams. The tower on the left bank was 112 feet high, and the one on the right bank 100 feet high.

Each leg of the towers was guyed back to a huge concrete deadman by 16 bridge strands. Like the tieback lines, these are 1½-inch bridge strands supplied in specified lengths by Bethlehem Pacific Coast Steel Corp. The deadmen were concrete blocks measuring 22×25 feet and sunk 15 feet into the solid sandstone of the canyon bank.



Side tilting of each of the big cableway towers is controlled by a Skagit GU8 2-drum hoist powered by a Hercules gasoline engine. This operator gets his signals by telephone. Phones are used to direct three different hoist operators.

These hydraulic 100-ton jacks placed between the strongbacks provide the means of adjusting the tension in the cables. They are also used to provide precise positioning of the suspended steel. Nuts on the continuously threaded rods hold the strongbacks in position when tension is released on the jacks.

point seven. After ten were attached at panel point nine, the six from panel point five were lengthened and moved to panel point 15; then two more were added to make eight lines. These eighteen lines supported each of the arch trusses until the closure was made and the structure became a self-supporting 3-hinged arch.

Make precise adjustments

Each pair of cables was equipped with a tensioning device that served the dual purpose of distributing the load equally between the cables and of positioning the arch trusses. At the panel points, the tieback cables terminated in long threaded rods that passed through holes in a pair of heavy steel strongbacks. Another pair of rods through the strongbacks tied the cables to the yoke, which was pin-connected to the bridge chord. A calibrated 100-ton jack, inserted between the strongbacks to jack them apart, made it possible for the cables to be tensioned. Lock nuts on the threaded rods held the system in place at the desired point.

The tieback towers, one 100 feet high, the other 112 feet, are made of steel members of the deck system, which was erected after the arch was finished. The towers are anchored to huge deadmen by Bethlehem bridge strands. The Lorain 30-ton Moto-Crane yards steel at the site.

Slight adjustments in the tension of one or more pairs of cables caused minute movements either horizontally or vertically at the ends of the suspended trusses. Thus, with more than 1,000 tons of steelwork hanging more than 500 feet out over the canyon from each side, it was possible to bring the ends into perfect alignment to insert the 20-inch pins which joined the trusses.

Actually, the jacking and positioning began the day before the closure was accomplished, and planning for it had started long before. During the days just before closure was to be made, a very careful record of the temperatures was kept, and this was correlated closely with the corresponding movement of the suspended steel. Anticipating the time of closure and estimating the probable temperature at that time, the crews began adjusting the jacks a day in advance.

At the last minute, the temperature

An American hoist operates the lines of the smaller cableway. This one is powered by a GM diesel engine with torque converter.

The last phase of the bridge operation—paving of the 6-inch concrete deck—was, along with earthwork for approaches, completed in about a month. Steel forms span between the stringers. The cableway tower at the end of the bridge supports the line delivering concrete to the deck.

(*Continued from preceding page*)

rose a few degrees higher than had been anticipated. When the closing member was swung into place, it missed by about one-quarter inch. This was quickly corrected by a slight adjustment of the jacks, and the 20-inch pins were slipped into place to make the final connection. This made the arch a self-supporting 3-hinged arch and made it possible for all of the tiebacks to be removed.

Before the structure could be converted to a 2-hinged arch, it was necessary to tie the lower chords together. The exact predetermined load was applied to the lower chord by 500-ton jacks, which were inserted between the telescoping members of the opposed trusses. At the proper point, the jacks were locked, holes were field-drilled in the matching plates, and the final connection was riveted.

Deck has long columns

With the arch truss completed, the erection of the deck steel was a relatively routine operation. However, the very long columns at each end of the bridge required some very special handling.

The first columns on each truss were 157 feet long and weighed 28.5 tons each. The three sections of each column were assembled on the ground so that the column could be set in one piece. But since the cableway was not high enough to pick up this long a piece and suspend it vertically, both cableways were used to handle these columns.

The 25-ton cableway picked up the top end of a column, while the smaller line took the bottom end. The two carriers then traveled out over the canyon together. The small cableway lowered the bottom end of a column so that it hung vertically from the big cableway. Workmen disengaged the line of the smaller cableway and proceeded to set the column in place. The columns were guyed in three or more directions until floor beams, stringers, and bracing steel could be erected to tie them in. This operation was used for the eight longest columns at each end of the bridge.

The remainder of the deck consists of floor beams between the columns, with seven stringers spanning between the floor beams in each span. All of this deck steel above the arch trusses was connected with high-tensile bolts. Chicago Pneumatic impact wrenches were used to tighten the bolts, and tension was checked with a torque wrench. Bolt tension was determined by the "turn-of-the-nut" method. Nuts were first snugged up and then tightened a half turn.

Field connections in the arch were riveted, but all steel above the arch was bolted. This provided an opportunity to compare the two methods; results indicated a considerable saving in manpower and equipment with the bolting technique.

Concrete deck

Steel forms for the 6-inch concrete deck were suspended from the stringers with form hangers. The slab was reinforced in both directions. The finished deck has two 15-foot travel lanes, two 4-foot sidewalks, and two 1-foot curbs for a total width of 40 feet. Plywood forms were used for the sidewalks.

Because of the presence of excessive quantities of poor material in the only available aggregate supply, the concrete for the bridge deck was required to be made from aggregates with specific gravities exceeding 2.5. To K-JPM, this simply meant purchasing the concrete from Merritt-Chapman & Scott, general contractor for Glen Canyon Dam, since M-C&S already had a heavy media aggregate plant in operation that produced aggregates to meet these specifications.

Reeder Construction Co., Albuquerque, N. Mex., picked up the concrete at the plant in buckets and de-

livered it to the cableway. Even before the bridge contractor had completed the structure, M-C&S started building the approach fills. When the bridge was finished and the cableways removed, the approach work was stepped up to a high speed that made it possible for earthwork and paving to be completed in about a month. Concrete placement, handled by Reeder, was started December 2, 1958, and was completed January 15.

Project superintendent for the K-JPM joint venture on the entire job was William A. "Bill" Choate. His staff included erection foreman Lee Boswell, tieback cable foreman James E. McKeown, rivet superintendent Howard Garner, rivet foremen Joe Fogliatti and Howard Hall, yard foreman Martin Krum, and office manager Larry McGarry.

Work on the bridge was under the general supervision of the Bureau of Reclamation staff, which is supervising construction of Glen Canyon Dam. L. F. Wylie is project construction engineer. His staff includes office engineer Howard L. Fink, field engineer Byron David, chief of general engineering section Norman W. Keefer, chief inspector William C. Donahue, and materials engineer Carl V. Gezelius. The regional director for the Bureau's Region 4 is E. O. Larson. The commissioner of the Bureau is W. A. Dexheimer. THE END

Concrete is placed over reinforcing steel for the two 15-foot travel lanes. Two 4-foot sidewalks and two 1-foot curbs bring the bridge to a 40-foot width. Towers at the left are the big 50-ton towers that support cableways to be used in placing dam concrete.

CSPA re-elects president

A. G. Cochran has been re-elected president of the Clay Sewer Pipe Association, an organization of manufacturers operating in 17 states north of the Ohio River and east of Indiana, and a member of the National Clay Pipe Manufacturers, Inc.

The organization named August Larson vice president, and Mrs. Reva D. Smart was re-elected secretary-treasurer. Two directors, Barton A. Holl and W. E. Robinson, were re-elected to the NCPMI to represent CSPA on the national level.

Cement-soil stabilization topic of HRB bulletin

Bulletin 198, "Cement-Soil Stabilization," is available for $1.40 from the Highway Research Board, 2101 Constitution Ave., Washington 25, D. C.

Five papers in the bulletin present data on: the effectiveness of fly ash as an additive and as a replacement for cement in soil-cement; an appraisal of the performance of soil-cement base courses on military airfields; short-cut methods for determining the cement requirements for sandy and clayey soils; and the effect of sulfates on the performance of soil-cement. A sixth paper presents a hypothesis that attempts to explain the differences in the nature of the cementing process in granular and in fine-grained (clayey) soils. Graphs, tables, and pictures supplement the text.

Goodrich to expand plant

The Marion, Ohio, hose plant of B. F. Goodrich Industrial Products Co. will begin expansion this spring in order to consolidate all of the company's manufacturing facilities for this line of hose. The job is scheduled to be completed before the end of the year.

American Cyanamid news

John J. Brosky has been named manager of the Grafton, Ill., industrial explosives manufacturing plant of American Cyanamid Co., New York City. Brosky was formerly assistant plant manager at that plant.

Factors affecting concrete uniformity

by STANTON WALKER, director of engineering

National Sand and Gravel Association

National Ready Mixed Concrete Association

The principal factors affecting the uniformity of ready-mix concrete are obvious: uniformity in quality and quantity of ingredients; uniformity in mixing, transporting, and discharge at the job; uniformity in handling from point of discharge to final placement; uniformity of placement and finishing procedures; and uniformity of protection and curing.

Aggregate from a single source is basically uniform as to mineral composition, but it may vary in grading so as to affect concrete uniformity significantly. Aggregates should be handled in such a manner as to avoid contamination and to reduce segregation to a minimum. Handling coarse aggregate is more difficult as the "length" of the grading increases. The use of multiple sizes, batched separately, is the best approach and is essential for adequate control of uniformity when the nominal maximum size exceeds 1 inch. Aggregates should be handled so as to insure reasonable uniformity in moisture content.

The strength-producing properties of different brands of cement vary widely, a fact often overlooked by the user. There are wide differences from source to source and even differences among shipments from the same mill.

There is no excuse for nonuniform batching, although ready-mix concrete presents special inspection and handling problems: the place at which the proportioning is done—and, frequently, the mixing—may be distant from the point of use; the time element may enter; the batches may be large; and centralized control may be lacking.

Principal sources of lack of uniformity in concrete as it is delivered to the job are usually connected with the control of mixing water and slump. Lack of uniformity can be due to variations in grading and moisture content of aggregates; temperatures of materials; air temperature; times and speeds of mixing. It may also be due to delays on the job; adding water at the job; and the demands of the job foreman.

There are a number of aids in the control of mixing water and slump. Moisture in aggregates can be measured quickly, and weighing devices can be used which make it easy to compensate for moisture. Dispatching can be used to control elapsed time between the start of mixing and delivery of the concrete. Uniformity in the mixing rate and time can be controlled by counters, supplemented by facilities for controlling the rate of revolution of the drum.

The problem of retempering, if water must be added, can be greatly alleviated by adequate mixing. Retempering should be avoided, but the addition of water, after mixing is supposed to have been completed, is sometimes justified. Some 20 to 30 revolutions of the mixer drum are needed to obtain anything approximating uniform incorporation of added mixing water. The temperature of the concrete and air exerts an important influence on quality; but the effect of temperatures, whether hot or cold, can be minimized by such things as timing and handling.

Admixtures add to the problems of control. Even the simple air-entraining admixtures emphasize the need

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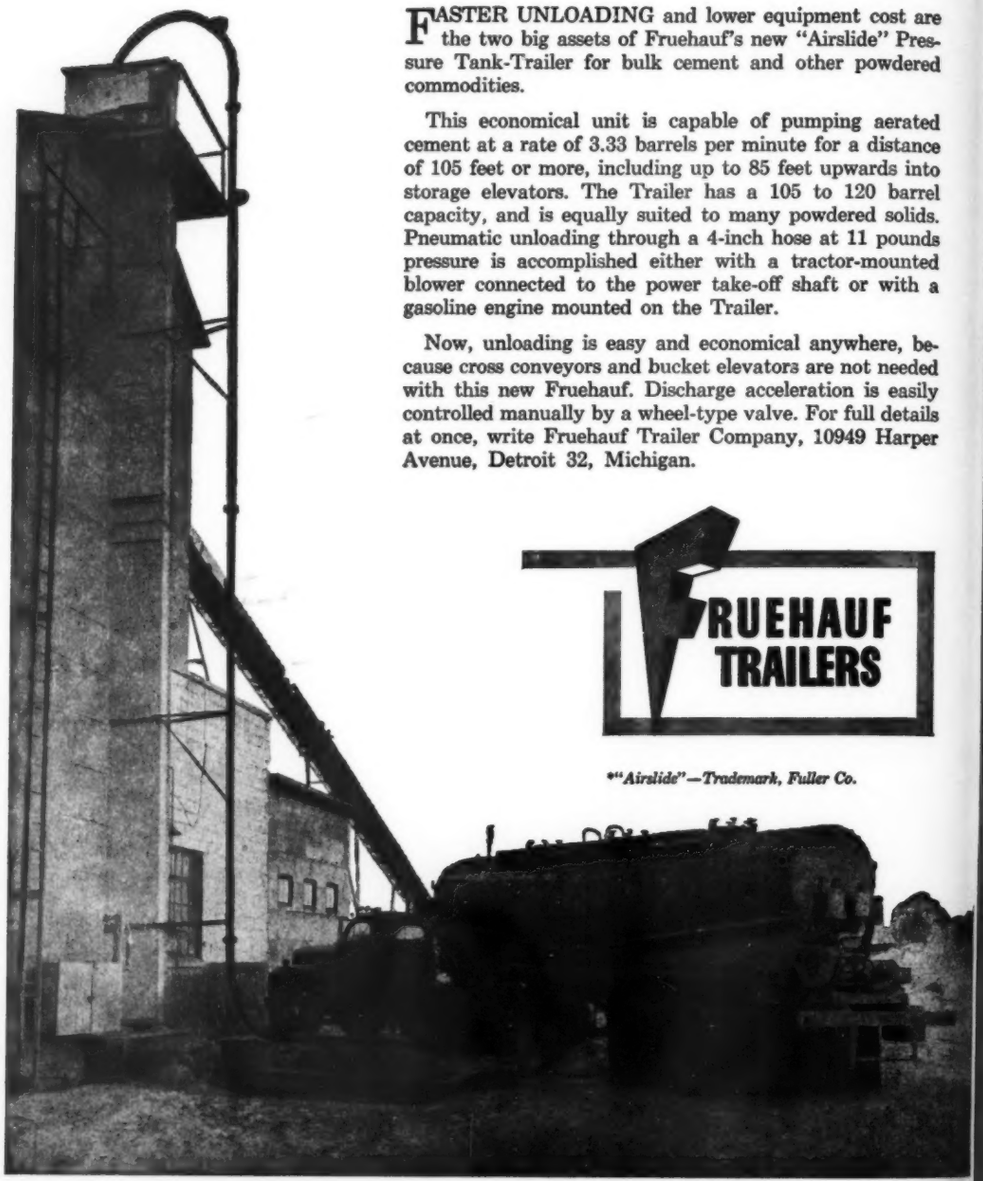


FASTER UNLOADING and lower equipment cost are the two big assets of Fruehauf's new "Airslide" Pressure Tank-Trailer for bulk cement and other powdered commodities.

This economical unit is capable of pumping aerated cement at a rate of 3.33 barrels per minute for a distance of 105 feet or more, including up to 85 feet upwards into storage elevators. The Trailer has a 105 to 120 barrel capacity, and is equally suited to many powdered solids. Pneumatic unloading through a 4-inch hose at 11 pounds pressure is accomplished either with a tractor-mounted blower connected to the power take-off shaft or with a gasoline engine mounted on the Trailer.

Now, unloading is easy and economical anywhere, because cross conveyors and bucket elevators are not needed with this new Fruehauf. Discharge acceleration is easily controlled manually by a wheel-type valve. For full details at once, write Fruehauf Trailer Company, 10949 Harper Avenue, Detroit 32, Michigan.

FRUEHAUF TRAILERS

*"*Airslide*"—Trademark, Fuller Co.*

For more facts, use Request Card at page 18 and circle No. 226

for time and mixing control. They represent another ingredient to be measured in very small quantities, unless the mix uses air-entraining cements. These, in turn, introduce still another problem. Overdosages of entrained air can result in substantial reductions in strength. Some multiple-purpose admixtures on the market can cause real difficulties if used in excessive quantities. The same need for control applies when water-reducing agents and retarders are used.

The consumer should receive concrete from a truck mixer as fast as possible. Discharging small increments from a large mixer is time-consuming and increases the water demand. It also makes segregation more difficult to control. And the continuous rotation of the mixer drum over long periods creates an additional water demand.

Long flat chutes should be avoided because they demand wet concrete and cause segregation. Chutes can be handled to minimize segregation; for instance, a baffle at the end of a chute will divert the concrete to a vertical fall.

To get the concrete fluid enough to transport itself decreases quality because of excess water and makes segregation inevitable. Uniform and correct placement methods will preserve the uniformity of high-quality concrete; careless methods destroy that uniformity. THE END

(This article has been condensed from a paper, "Factors Affecting the Uniformity of Concrete," delivered before the Concrete Industry Board.)

Massey-Ferguson buys control of engine firm

Massey-Ferguson, Ltd., of Toronto, Canada, has purchased control of F. Perkins, Ltd., Peterborough, England, a diesel-engine manufacturing company that markets throughout the world a variety of engines for tractors and other vehicles, agricultural and industrial power equipment, and marine craft. Supplies of engines to existing Perkins customers will be maintained.

Air Reduction opens plant

Air Reduction Sales Co., a division of Air Reduction Co., Inc., New York City, has opened a new plant for the production of oxygen and nitrogen at 1100 Packard St. in the Armourdale district of Kansas City, Kans. The new plant replaces a facility at 1000 W. 26th St., Kansas City, Mo.; but the district offices, storeroom, and engineering-services department remain at 2701 Warwick Trafficway, Kansas City, Mo.

Yale & Towne names

Robert B. Brown has been named a special field sales representative in the South for the line of industrial lift trucks and tractor shovels manufactured by the Yale Materials Handling Division, Yale & Towne Mfg. Co., Philadelphia. Brown was former materials-handling director of the National Retail Lumber Dealers Association.

A 92-TON STEEL GIRDER is swung into place for a 558-foot vertical-lift span in a railroad bridge over the Arthur Kill between Staten Island, N. Y., and Elizabeth, N. J. The bridge will be used by the Staten Island Rapid Transit Railway Co., a subsidiary of the Baltimore and Ohio Railroad Co. The superstructure for the span is being furnished and erected by the American Bridge Division, U. S. Steel Corp., Pittsburgh, Pa. Girders were fabricated at Ambridge, Pa., moved by rail to Elizabethport, N. J., loaded on a barge, and floated down the Arthur Kill to the bridge site.

Labor review

Central Illinois laborers, carpenters wind up talks with local AGC

The Central Illinois Builders (AGC) put the final touches on new agreements for laborers and carpenters in three central Illinois cities.

For Decatur laborers, a 27-month agreement boosted the base rate 15 cents an hour to $2.75. Another 10 cents an hour is due in January, 1960, with the contract due to expire March 31, 1961.

Carpenters in Paris, Ill., received a 15-cents-an-hour wage boost on March 1, upping their base rate to $3.15. Another dime will be added in 1960, and a final 10 cents in 1961.

An unspecified wage hike brings the hourly rate for laborers in Rushville to $2.52½. The agreement expires March 31, 1960.

NSPE would erase all Taft Act amendments in Kennedy labor reform bill

The National Society of Professional Engineers, concerned lest professional employees be forced into building trades unions under prehire agreements between contractors and the craft organizations, came out in opposition to portions of the Kennedy labor reform bill and urged that Taft Act amendments and reform legislation be considered separately by Congress.

The society wants the prehire agreement permit deleted from the Kennedy bill. In fact, it would erase all Taft Act amendments, leaving them for consideration in "an atmosphere less charged with urgency." However, if Congress should deem it advisable to include a construction-industry amendment with a labor reform bill, NSPE asks that the Administration's "certification-without-election" method be substituted for Kennedy's prehire agreement proposal.

The building trades are supporting the Kennedy measure, and have indicated that the Administration's certification proposal, which has the backing of AGC, would be an unacceptable substitute.

Cement masons settle with Michigan Road Builders for 30-cent package

Michigan cement masons ended a strike against the Michigan Road Builders Association by accepting a 30-cent package.

The union and the Road Builders agreed to a 12-cent hourly pay raise March 1; 10 cents, September 1, 1959; and 8 cents, September 1, 1960, in Zones 1 (Detroit metropolitan area) and 2 (southern Michigan). The hourly rate went to $3.37 in Zone 1 and $3.22 in Zone 2 last month.

Increases in Zone 3 under the agreement were 13 cents, March 1; 12 cents, September 1, 1959; and 8 cents September 1, 1960.

Carpenters cite automation as threat to job security in discussing 4-day week

On the theory that "the hours of work are too long as long as there is one building tradesman who cannot find a job," the official publication of the United Brotherhood of Carpenters and Joiners discusses the chances for a 4-day week.

An article in a recent issue of *The Carpenter* calls for the shorter workweek on the ground that part of the workers' rightful share of the ever-increasing productivity in the construction field could be given them in the form of shorter hours rather than higher pay. The article declares:

"New materials and new techniques are constantly increasing the amount of construction a man can put in place in a day or a week or a month. This means that growth in dollar volume construction is not reflected by a proportionate increase in the number of building tradesmen employed to get the job done."

One of the most urgent reasons for a reduction in work hours, in the union's opinion, is that whereas business activity has recovered much of the ground lost during the recession, unemployment is still hovering around the 4-million mark. Of the two million workers laid off during the recession, one million will never be rehired because their jobs have been wiped out by automation, the article says.

"Bitter fight" waged in Indiana over repeal of right-to-work law

The "bitter fight" for repeal of Indiana's right-to-work law is on in earnest, declared the National Right to Work Committee; and in Indiana, the State Right to Work Committee urged members to write to four state senators to save the law. Senators named were Richard Newhouse, Robert P. O'Bannon, Howard Steele, and Ruel W. Steele.

The Indiana House of Representatives voted 69 to 28 to repeal the 1957 law, but the balance of power was close in the state Senate. The National RTW Committee said "union strategists can corral only about 19 votes, 7 less than they need."

Questions I'm asked about

Equipment Leasing

by **ROBERT SHERIDAN, president,**
Nationwide Leasing Co., Chicago, Ill.

Q. What is the volume of equipment leasing in the construction industry?

A. At the end of 1958 there was approximately $42 million worth of production equipment on long-term lease in the construction industry—the largest single user of long-term leasing in the nation. This dollar volume is more than twice the amount on long-term lease in the industry three years ago.

Long-term leasing is growing rapidly in the construction industry because contractors need to conserve working capital, which is extremely tight. The lack of capital is a major barrier to growth in the industry. The average ratio of current assets to current debt in the industry is 1.62:1, one of the lowest in all industries. Average current debt for the industry is 91 per cent of net worth; total debt averages at 132 per cent of net worth.

In addition, the increasing amount of government work ties up large amounts of the contractor's cash for equipment, labor, and materials while he waits for red tape to produce a government check. Increase of stable, year-round operations has also permitted contractors to change from costly short-term rental to more economical long-term leasing.

Q. What is equipment leasing?

A. Equipment leasing is a method of obtaining the use of income-producing equipment (fixed assets) without capital investment. When equipment is obtained in this way for use in production, the units remain the property of the leasing company, but are used by the lessee, who pays the leasing company a fixed charge for a stated period for using the equipment. Leasing is a long-term arrangement, normally from three to ten years, though in some cases it may be as little as two years or as long as 15 years. It is different from equipment *rental*, which is a short-term arrangement in which the rental firm rents out new or used pieces for a brief period, reclaims them at the end of the period, and then rents the equipment to other users.

In recent years, interest in leasing of heavy-construction equipment has grown throughout the industry, but the subject remains one about which there is wide misunderstanding. Because of this interest and the need for clarification of the subject, CONTRACTORS AND ENGINEERS asked Robert Sheridan, president of Nationwide Leasing Co., Chicago, to prepare an article for this issue setting forth the procedure, advantages, and effects of construction-equipment leasing. Mr. Sheridan's article takes the form of questions most frequently directed to Nationwide, one of the leading firms specializing in equipment leasing, by men in the construction industry.

Q. How does equipment leasing work?

A. A company which wishes to lease equipment from Nationwide Leasing Co., for example, submits an application describing itself—its business, its financial position, etc. It lists the specific manufacturer from whom it wishes to secure the equipment, the price of the equipment, the length of the lease terms it desires, and the form of payment it desires. The leasing company then purchases the equipment and arranges for its shipment directly to the lessee's plant or store. Upon acceptance of the equipment, payments start. All equipment, no matter how many items are involved, can be covered by a single master lease and can be paid for in a single monthly payment. This is true regardless of how many suppliers are involved. This reduces the user's bookkeeping considerably.

Q. What types of equipment are leased?

A. All types. In 1958, equipment leased ranged in cost from a $17 hand truck (part of a $140,000 equipment lease with a midwestern hospital) to $5 million worth of construction equipment. Both standard and specially built units can be leased.

Q. Why has equipment leasing increased so rapidly?

A. Basically, equipment leasing has increased as a result of the steadily increasing cost of capital equipment. Leasing has historically been a means of permitting businessmen to function without owning everything they need to do business, since profits are made by using capital equipment, rather than owning it. Specific reasons for the current growth of equipment leasing are:

a. Profit-producing equipment is put to work without capital investment. This is particularly important since working capital remains tight, despite the slight improvement resulting from inventory liquidation.

b. To increase profits without increasing a company's own capital investment.

c. To increase production without reducing liquidity of working capital.

d. To reduce the risk of loss caused by rapid obsolescence of specialized equipment.

e. To obtain equipment for limited-term use, either for special orders or for developmental or research work. This is particularly important where firms are working on defense contracts.

f. For manufacturers of industrial equipment, leasing programs have proved to be an effective method of increasing sales.

Q. What are the advantages of leasing?

A. Other advantages to users of leased equipment, in addition to those cited in the answer to the previous question, lie in how leasing improves a company's financial situation. Specifically:

a. Leasing offers financing without dilution of ownership or control.

b. In leasing, there is no necessity for a periodic cleanup of funds or a pledge of receivables.

c. Leasing may offer certain tax-timing advantages in specific instances.

d. Leasing makes for a cleaner balance sheet. Only the lease payments due within 12 months appear on the balance sheet, thus affecting the ratio of current assets to current debt very little. As a result, a company is able to use its established lines of credit for short-term borrowing without disturbance.

Q. What types of companies lease equipment?

A. All types of companies in virtually every industry today lease

(Continued from preceding page)

equipment. They range in size from quite small companies (restaurants and motels, for example) to giant companies in the billion-dollar-a-year sales category. According to Nationwide Leasing Co.'s annual surveys, the construction (including road-building) industry was among the 10 leading industries using leased equipment in 1958.

Q. What is the length of equipment lease terms?

A. Terms range generally from 3 to 10 years or longer, though in some cases, where smaller sums are involved, they can be as little as two years. The user determines the length of lease he prefers, and arranges the payments to suit his own needs. Leases are usually written on a uniform payment basis, although they can be written on straight line, declining balance, sum of the digits, or any schedule preferred by the user.

Q. Is equipment leasing useful as a sales tool for manufacturers of production equipment?

A. In a number of industries, leasing programs have proved to be an effective method of increasing sales. Customers are offered the option of purchase or lease, with the leasing company assuming the lease contract and paying the manufacturer 100 per cent cash for the equipment when it is delivered. The leasing company sets up a complete sales training program for the manufacturer so that his leasing plan will have maximum impact.

In merchandising-leasing plans, leasing is used as a primary sales tool, giving the manufacturer's salesmen an important new way to move goods. The customer has the benefit of the lease, while the manufacturer has a cash sale. Not only does this normally enable a manufacturer to increase his sales by the added leasing volume, but the interest generated around the leasing plan results in opening new markets for the product and inevitably results in increased direct sales, often greater than the leasing volume.

Q. How does leasing compare with other methods of financing?

A. Leasing offers 100 per cent financing and provides the contractor with greater cash flow than any other financing method. As a result, the relative cost of leasing is less than other methods. Any expenditure of money to acquire equipment involves paying something for the use of the money. Even in the case of outright cash purchase, the contractor is sacrificing the earnings that his working cash would yield; this, in effect, is what he is "paying" for the use of his own money. In the construction industry this means an average "cost" of 34 per cent—the average *before-tax* rate of profit on net working capital contractors earn.

Leasing frees more working capital immediately than any other method of obtaining equipment. This cash excess earns profits for the contractor at the company's normal rate for the life of the lease. Over the term of the lease, the additional profits produced by this cash excess (for example, at the average rate of profit cited above) will be so great that the relative cost of leasing will be lower than other financing methods. (A complete analysis of the comparative cost of leasing and other financing methods, entitled "Lease or Buy? Comparative Costs of Equipment Acquisition," has been developed by the Foundation for Management Research. Single free copies may be obtained by writing to the Foundation at 121 W. Adams St., Chicago 3, Ill.).

Q. What are recent trends in leasing?

A. Two new trends have shown themselves: (1) the sale-leaseback transaction (commonly, but erroneously, termed purchase-leaseback), and (2) merchandising-leasing plans involving the cooperation of equipment manufacturers and a leasing company to increase sales.

In the sale-leaseback transaction, a company builds a new plant, sells the equipment and facilities to the leasing company as soon as it is completed and ready for use, and immediately leases it back. This is often done with older plants and equipment. This enables firms whose financial ratios would not otherwise permit them to expand at so great a rate to do so without straining their capital structure.

Q. What operating situations make leasing most advantageous?

A. a. In general, where companies can expand their operations profitably, if additional equipment and machinery were made available at smaller annual expense than through use of their own capital.

b. Companies which find themselves short of working capital, but which have sufficient equipment, can remedy the situation through sale-leaseback transactions.

c. Companies faced with competition that is using the latest equipment, while they themselves lag on cost-saving. In this situation, acquiring the new equipment is essential, but often a large initial cost is prohibitive. In this situation, leasing can often provide the solution.

d. Companies which hold a tight check rein on capital expenditures and financial ratios. Leasing permits the management of these companies to secure new equipment without forcing the board of directors to raise

more capital.

e. Where rapid obsolescence is a strong possibility, leasing bypasses the problem of capital investment in such equipment.

f. For pilot plants and developmental or experimental projects, leasing offers a means of opening new areas of production without draining working capital on such unproved ventures.

g. Companies engaged in defense contract work are often enabled, through leasing, to obtain needed equipment for the term of the contract. In this way capital is not frozen in equipment that may not be useful after the contract has been fulfilled.

Q. Do leasing agreements contain purchase options?

A. Yes, leasing agreements can contain purchase options. However, our firm advises against including purchase options in the leasing agreement. The reason is that a purchase option generally converts a leasing agreement into a conditional sales contract, in the eyes of the Internal Revenue Department. There are some exceptions to this general rule, but these exceptions are uncertain and depend on specific rulings by the Internal Revenue Department at the conclusion of the contract, many years later. For this reason, purchase options are not recommended. True lease payments, as differentiated from disguised conditional sales contract payments, are legitimate deductions as operating expenses. Conditional sales contracts are deductible only at the rate specified in the federal government's depreciation schedules.

Q. Do leasing contracts contain renewal options?

A. Yes, of course. In leasing, the cost of the equipment is paid for entirely in the original leasing term. Renewal options are usually available at extremely low cost. They can range in length from one-year options to indefinite terms.

Q. Does leasing offer companies tax advantages?

A. This has been an area of much misinformation. Leasing is not a method of tax avoidance; its primary value lies in the way it frees working capital for other uses. In certain specific situations, leasing may also offer companies advantages of tax-timing which are not to be ignored. Leasing charges are legitimately deductible as business expenses. As such, they reduce taxable income *now*.

Leasing may also offer a tax advantage that can be of particular importance to companies which find that their equipment tends to become obsolete much more quickly than government depreciation tables permit. For example, a company using equipment that experience shows can be expected to require replacement in seven years may find that depreciation tables permit depreciation only over 15 years. By leasing the equipment for a seven-year period, this company would be able to deduct the full cost of the equipment from taxable income in seven years. If the company had purchased the equipment, it would only have used seven years' worth of depreciation and would have to forego further depreciation benefits, if it wished to replace the equipment at the end of seven years.

In certain sale-leaseback situations also, tax advantages may accrue, since the sale of an asset normally involves taxation at the capital-gains rate, if a profit is made, rather than at the corporate rate.

Q. Is leased equipment always new equipment? If so, what does the leasing company do with equipment after it has been leased out on a two or three-year arrangement?

A. Most equipment leased on long-term arrangements such as we have discussed is new equipment. In the construction field, there is almost no long-term leasing of used equipment because of the condition of used machines. This is a major difference between leasing and short-term rental. At the end of the leasing period, if the contractor wishes to replace the equipment, the leasing company will dispose of it as suits itself. If the contractor wishes to exercise his renewal option, this is available to him at quite low cost. In any event, if the equipment is to be disposed of, the leasing company will most likely act according to the market situation. One thing is certain, however: Nationwide is not going into the short-term rental field.

Q. How are maintenance and repairs on the equipment handled during the leasing period?

A. Maintenance and repairs are handled by the lessee (contractor). Warranties are settled between contractor and seller prior to the lease. In other words, all terms are agreed upon before the lease is made final. The equipment will be serviced by whoever would have serviced it in the event of a direct sale. After all, the leasing company pays 100 per cent cash on the barrelhead to either manufacturer or distributor within 24 hours of delivery of equipment, so the service provided for any good customer is certainly to be expected.

Q. Does the equipment distributor figure in the picture of leasing arrangements?

A. Indeed he does. Leasing is a natural for distributors as well as for manufacturers. In other words, the contractor obtains his equipment from whomever he normally would obtain it. He obtains his financing

(Continued from preceding page)

from the leasing company, which pays the supplier designated by the contractor in his lease application. Many manufacturers that lease equipment and operate through distributors protect their distributors by refusing direct factory-to-consumer deals. A leasing deal is the same as a direct sale as far as the seller is concerned. He receives his cash from the leasing company, which means that the only relationship from that point on is between the leasing company and the lessee or contractor.

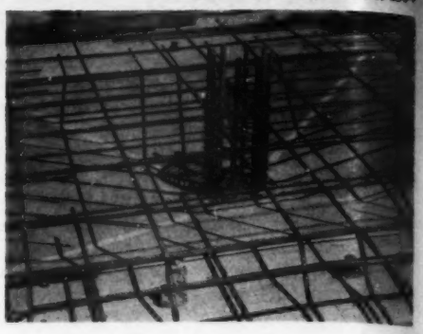
In sum, the manufacturer or distributor is out of the picture the moment the equipment is supplied, except for contracted services guaranteed by warranties, etc.

Q. How can I tell if my company should lease or buy?

A. There is no method of financing that fits every situation equally. Factors to be judged include the availability of working capital, the rate of profit the company earns on its working capital, the effect of leasing on the company's cash flow as compared with other financing methods, the company's competitive situation, and whether there are any tax advantages in the company's special situation.

Expert advice never hurts. Readers may obtain an analysis of their situation, without obligation, by writing to the author, care of Nationwide Leasing Co., 11 S. LaSalle St., Chicago 3, Ill.

THE END



Pressure-sensitive tape covers the mitered joints of plywood column-cap forms during construc- of the County-City Building parking garage in Tacoma, Wash. After forms were removed, the cap had a smooth finish; grinding was not necessary.

Pressure-sensitive tape improves concrete work on column caps for parking garage

Pressure-sensitive tape on plywood column-cap form joints eliminated fins and allowed more form re-uses during the construction of a 2-story parking garage in the County-City Building, Tacoma, Wash.

Macdonald Building Co., Tacoma, general contractors on the project, used Scotch Brand No. 471 tape on the high-density overlaid fir plywood forms. They found that the tape made formwork cleaning easier and helped keep the plywood edges from being coated with cement. The tape is designed to hold moisture in the concrete at the joint and retain maximum strength over the entire surface area. The result is a smooth-finish concrete, eliminating the need for grinding or finishing.

ACI elects officers; presents five awards

Phil M. Ferguson has been elected to a one-year term as president of the American Concrete Institute. Ferguson, professor of civil engineering at the University of Texas, succeeds Douglas McHenry. Lewis M. Tuthill, concrete engineer in the Division of Design and Construction of the California Department of Water Resources, has been elected to a two-year term as vice president. Roger H. Corbetta, George C. Ernst, E. A. Finney, and Walter J. McCoy were named directors.

ACI also presented 1958 awards to the following: The Turner Medal to Douglas E. Parsons; the Kennedy Award, posthumously to Joseph D. Stasio, Sr.; the Wason Medal for Research, to F. T. Mavis and M. J. Greaves; the Wason Medal for Most Meritorious paper, to John P. Brotchie; and the ACI Construction Practice Award to Jack E. Rosenlund.

Improved water repellency of concrete noted by HRB

Bulletin 197 from the Highway Research Board, "Improving the Water Repellency of Hardened Concrete," contains two papers. The first, on scaling resistance of concrete as improved through silicones, covers factors affecting scaling, field and laboratory tests, etc.

New York State's experience in the use of silicones is reported in the second paper, which discusses investigations of silicone application on field installations.

Available for 50 cents, the bulletin may be purchased from the HRB, 2101 Constitution Ave., Washington 25, D. C.

Here's how L-W "BIG ONES" measure up...

B Tournapull® with Fullpak® scraper

CAPACITY...

"--Fastest loading"

28 YDS HEAPED . . . and two years of load-weight tests prove B 'Pulls* consistently load a *greater percentage* of capacity *than any other scraper.* Fullpak's low, wide bowl, deep-bellied apron and arched tailgate "boil" the dirt for faster heaps, fewer voids, more pay-yards every load.

SPEED...

INSTANT-RESPONSE ELECTRICITY controls bowl lift, tailgate and apron. For high-speed maneuverability, you have electric kingpin-steer. With either torque converter or 10-speed step-gear transmission, you work or travel at *fastest* practical speed. And this 335-hp machine travels at over 30 mph!

DEPENDABILITY...

EXCLUSIVE L-W POWER-TRANSFER DIFFERENTIAL and "duckwalk" ability *keeps you working* at maximal speeds in soft going. Downtime is reduced because electric-control system *eliminates* many "trouble-maker" parts. All components are easy to reach. Tournapull *simplicity* saves you money.

Ask for a demonstration!

Twin-C* Push-Tractor

L-W 660 Motor grader

"--Fastest pushing"

"--Fastest working"

436 HP, 40-TON WORK-WEIGHT let Twin-C push-load today's *biggest* scrapers *fast*. 4-wheel drive on 7′-high, 2½′-wide tires, with L-W power-transfer differentials, provide the needed flotation and traction to work steadily in all types of materials.

MORE BLADE WORK...FASTER ... than *any* other grader, of *any* size, at *any* price ... proven by owners everywhere! Biggest of L-W's 7 sizes of Adams* graders, 660 POWER-*Flow*® is nearly 14 tons of grader applying 190 hp to your work through a torque converter. Rugged 160-hp "stick shift" 660 also available.

PUSH-LOAD FASTER with *non-stop shift* ... *kingpin-steer* for faster maneuvering and positioning ... *20-mph speed*. With synchronized torque converters, constant-mesh transmissions, Twin-C matches scraper speeds better, gives scrapers a fast-speed shift-saving boost out of cut.

WORK AT FASTEST POSSIBLE SPEED AUTOMATICALLY ... with torque converter plus tail-shaft governor on 660 POWER-*Flow*. Speeds to 27.4 mph! Positive blade control through BIG 63″ circle. Blade movement is fast ... you go from deep ditch-cut position to high bank-cut in less than a minute!

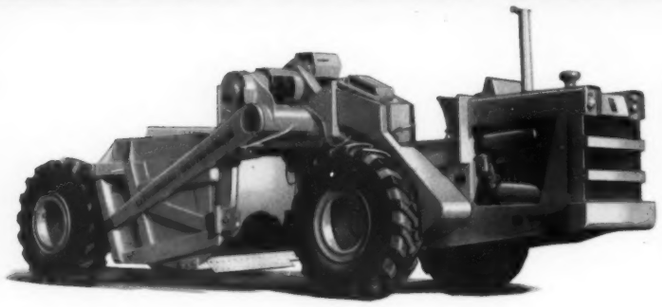
JOB-PROVEN RUGGEDNESS: Twin-C's two transmissions, two torque converters, two differentials, and other assemblies, are standard L-W components proven on thousands of earth-moving jobs all over the world. Twin-C is built big and strong to handle heavy work. Entire unit is a heavy-duty "reserve strength" machine.

Get full details now!

ALL WELL-KNOWN ADAMS STRENGTH FEATURES are standard on the "660's": continuous-welded one-piece frame, full-floating rear axle, welded bar-and-plate front axle, anti-friction bearings on all gears and shafts, life-time lubricated universal joints, and rubber-mounted engine.

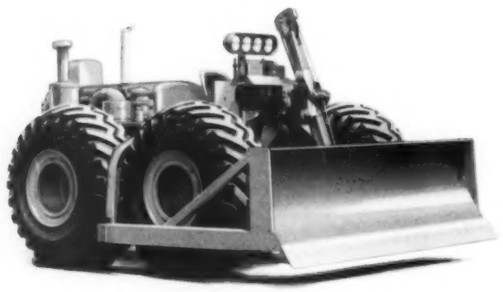
See one in action!

...the "before and after" tool



D TOURNAPULL® with 9-yd capacity saves you money on smaller-yardage scraper work around your job. It builds haul roads . . . prepares cuts and fills . . . shoulders and backfills . . . stockpiles topsoil . . . and handles miscellaneous clean-up work on even the biggest projects. "D" has 138 hp, 29.5-mph speed, electric controls, and is as rugged as *any* scraper.

...rubber-tired specialist on ANY project



TOURNATRACTOR®, 218-hp tractor-on-rubber belongs on any *dirtmoving* project . . . because it is completely *mobile*. With 17.2-mph speed, it has both working and moving speed to handle any tractor jobs that pop up on big work-areas. Use it for pulling compactors . . . it supplements your rollers with 20 tons of its *own* weight concentrated on its 4 big 2'-wide tires. Torque-converter, constant-mesh transmission helps it doze *fast*. Tournatractor will earn money on *any* standard tractor assignment.

Litho in U.S.A.

LA-2108-DC4

...add an equipment expert as a "partner"

Job-in and job-out, your L-W Distributor can be your biggest profit booster. He will serve you as a non-salaried partner . . . who's an expert on equipment problems. Remember: while you are handling only a few contracts a year, he is associated in some way with *dozens* of earthmoving jobs.

Put his experience and know-how to work for you. Call him in before you prepare your bids. Get his suggestions on how you can handle the job at lowest cost. Let him analyze your fleet, to help determine which rigs can still earn their keep . . . which ones need overhauling or reconditioning . . . and which, if any, you should trade in on new machines to protect your profit margin.

Your L-W Distributor can be a big help, too, in planning an efficient *maintenance* setup. He'll check over your parts and replacement stocks, and help arrange a schedule so his service department and yours can work together with greatest efficiency.

Next opportunity, visit your L-W Distributor. You'll find him and his staff interested in helping you in all phases of your business . . . from production problems to machinery selections, to financing.

LeTOURNEAU-WESTINGHOUSE COMPANY
Peoria, Illinois
A Subsidiary of Westinghouse Air Brake Company
Where quality is a habit

Warner & Swasey changes offices and personnel

The Warner & Swasey Co., Cleveland, Ohio, has reorganized its national setup into eight basic territories: Los Angeles, with district office there and regional offices at San Francisco and Seattle; Denver; Houston, with offices there and at Dallas; Chicago, with offices also at Winona, Minn., and Kansas City; Cleveland, with offices there and at Detroit and Cincinnati; Philadelphia, with offices there and at Pittsburgh; East Orange, N. J., with offices there and at Boston and Syracuse; Atlanta, with offices there and at Charlotte, N. C.

Seven men have been reassigned. Ed E. Bloniarz has been transferred to the Syracuse regional office as district representative. James J. Ferguson, who has been handling the Hopto line in the Seattle regional office, now adds the Gradall line to his assignment. Vern C. Nelson in the Winona office will handle both lines in Minnesota, North and South Dakota, and in Manitoba, Saskatchewan, and western Ontario, Canada.

Robert R. Nicholson has been appointed to the Houston area; E. J. Sehl, district representative in Denver, will cover Montana, Wyoming, Colorado, and New Mexico. Troy G. Sitter and Cyril Smith have been transferred as district representatives to the San Francisco and Boston regional offices, respectively.

Company name changed

Brunner & Lay—Eastern, Inc., is the new name for Brunner & Lay Rock Bit of Philadelphia, Inc. The Philadelphia address remains the same.

The company has opened a branch office, 203 Victory Road, Dorchester, Mass., near Boston. The branch will carry a complete line of air-tool accessories and rock-drilling tools.

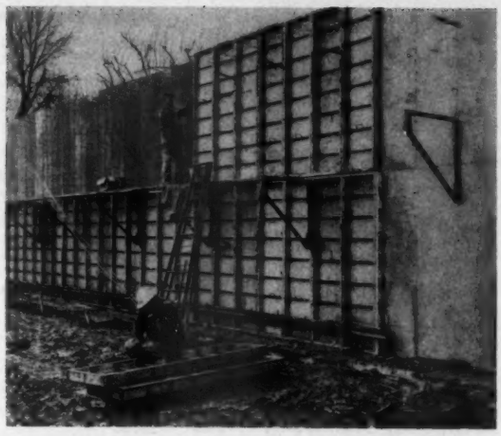
Huber-Warco appoints two sales representatives

John K. Shoemake and Carl B. Paepke have been appointed district sales representatives for the Huber-Warco Co., Marion, Ohio. From headquarters in Seattle, Wash., Shoemake will cover Montana, Idaho, Wyoming, Oregon, Washington, Alaska, and the provinces of British Columbia and Alberta, Canada.

Working out of Rochester, N. Y., headquarters, Paepke will serve the New England states, upper New York State, and the Canadian provinces of Ontario, Quebec, New Brunswick, and the Maritimes.

GE department moves

The Communication Products Department of General Electric Co., formerly located at Syracuse, N. Y., has transferred its headquarters to Lynchburg, Va. The engineering, manufacturing, sales, and product service organizations for two-way radio systems are now consolidated at the new location.



FAST AND EASY—that's the way workmen put up these Symons forms on the new 160 × 100-foot Globe Light & Brake Service Co. headquarters in Portland, Ore. The longest wall, 16 feet high and 160 feet long, was poured in two 80-foot-long sections for the full wall height. Each pour was completed in a 2-hour period.

Names in the news

Robert E. Harvey, new president of Merritt-Chapman & Scott Corp.

M-C&S elects president, chairman of board

Robert E. Harvey has been elected president of Merritt-Chapman & Scott Corp., New York City. Previously senior executive vice president, Harvey will now assume operational responsibility for the company's diversified activities.

Louis E. Wolfson, who formerly held the dual post of president and board chairman, retains the latter post and will continue as chief executive officer of the firm.

Hoover Medal presented to Lt. Gen. Wheeler

Lt. Gen. Raymond A. Wheeler (U. S. A., ret.) has received the Hoover Medal for 1958. This outstanding engineering award is presented annually by the American Society of Civil Engineers, American Institute of Mining, Metallurgical and Petroleum Engineers, American Society of Mechanical Engineers, and the American Institute of Electrical Engineers.

The award was presented at a special meeting and dinner of the Society of American Military Engineers. Gen. Wheeler was president of SAME in 1950 and has served on its board of direction since that time. Since his retirement from the Army in 1949, Gen. Wheeler has been associated with the International Bank for Reconstruction and Development as consultant.

Calcium Chloride elects

William E. Dickinson has been elected vice president of the Calcium Chloride Institute. He will continue as chief engineer and will assume responsibilities for the development and completion of annual programs of institute activities.

Highway commission elects chairman

L. F. Quinn has been elected chairman of the Arizona State Highway Commission. At the same time, the commission named Frank L. Christensen vice chairman; installed Wilbur F. Asbury as a new member; and reappointed state highway engineer William E. Willey and commission secretary Justin Herman.

Quinn replaces William P. Copple, who has retired after a year as chairman and four years as a member of the commission.

NBCA elects officers

John W. Kelly has been re-elected president of the National Bituminous Concrete Association. Kelly is a partner in the Imperial Paving Co., Oklahoma City. At the same time, F. C. Leffingwell, partner in the Asphalt Paving Co., Inc., Coral Gables, Fla., was re-elected vice president of the organization.

BTEA elects officers

Joseph A. Courter has been re-elected president, for the third term, of the Building Trades Employers' Association of the City of New York. Other officers re-elected are I. Roy Psaty, vice president; Jack W. Zucker, second vice president; and William N. Angus, treasurer. Nicholas B. O'Connell was elected third vice president, replacing H. Earl Fullilove who now serves as vice chairman of the board of governors. Peter W. Eller continues as chairman of the board of governors.

Dubin Associates news

Edward A. Sobolewski has become an associate in the consulting engineering firm of Fred S. Dubin Associates of Hartford, Conn., New York City, Boston, and St. Louis. Sobolewski will be in charge of the New York City office.

Consulting firm names

O. W. Kayser and Peter H. Smith are assistant vice presidents of Gibbs & Hill, Inc., New York City. Kayser supervises railroad and electric-transmission projects; Smith is chief project engineer.

Kuljian appoints manager

William Mensing is the new advertising and public relations manager of The Kuljian Corp., engineers and constructors of Philadelphia, Pa. He has been active as a public relations consultant, and for 14 years was a staff reporter with *The Philadelphia Inquirer*.

William R. B. Froehlich, chief deputy secretary of highways for the Pennsylvania Department of Highways.

Pennsylvania Highways appoints Froehlich

William R. B. Froehlich has been appointed chief deputy secretary of highways for the Pennsylvania Department of Highways. For the past seven years he has been executive director of the Public Parking Authority of Pittsburgh.

In 1957, Froehlich was president of the Pittsburgh chapter of the American Society of Civil Engineers. He is a member of the Institute of Traffic Engineers, the National Society of Professional Engineers, and the American Society of Planning Officials.

Goodkind & O'Dea news

John W. Kinney has joined Goodkind & O'Dea, consulting engineers of Hamden, Conn.; Chicago; Bloomfield, N. J.; and New York City. He will be director of field operations for the firm. Kinney was formerly resident engineer for D. B. Steinman, consulting engineer, on the Mackinac Straits Bridge.

Kansas highway engineer receives magazine award

Walter Johnson has been awarded the second annual highway award from *Kansas Construction Magazine* at the convention of the Kansas Contractors Association. Chief engineer for the State Highway Commission of Kansas, Johnson was honored for advancing the cause of better highways in the state.

McFarland-Johnson firm

William H. McFarland, P. E., and John W. Johnson, P. E., have established the firm of McFarland-Johnson, consulting engineers, with offices at 333 Front St., Binghamton, N. Y., and 405 Sidway Bldg., Buffalo, N. Y. Johnson was formerly New York State superintendent of public works.

Nevada Highways names Pine to top post

Edward L. Pine has been appointed state highway engineer of the Nevada Department of Highways, and W. O. Wright has been named assistant state highway engineer. Pine replaces H. D. Mills, who is being retained as a special consultant to the highway department. Wright takes over the post formerly held by W. T. Holcomb, who resigned to accept a position in private industry.

Division engineer G. B. Brockway replaces Wright as head of Division 1 in Las Vegas.

Kirkham, Michael news

Nebraska's former state engineer, L. N. Ress, has become an associate and chief highway engineer in the consulting engineering firm of Kirkham, Michael & Associates of Omaha, Oklahoma City, Fargo, and Rapid City. Ress had worked with the Nebraska Department of Roads for 37 years.

Col. Wilson named head of Crops' Detroit District

Col. Woodrow W. Wilson will become district engineer of the Detroit District of the U. S. Army Corps of Engineers in July. Now assigned to U. S. Army Europe, Col. Wilson is operations officer of the engineer section of the 7th Army. He will succeed Col. Peter C. Hyzer, who will attend the Industrial College of the Armed Forces at Fort Lesley J. McNair, Washington, D. C.

Oldest man employed in construction dies

John T. Croswell, employed as an estimator by Baltimore Contractors, Inc., Baltimore, Md., died early this year at the age of 100. He was believed to be the oldest man employed in the construction business in this country. Croswell joined the firm in 1933 at the age of 74, when Victor Frenkil was just beginning the contracting company.

Asphalt Institute names new district engineer

Clinton C. Gregory will fill the new post of district engineer for North and South Dakota for the Asphalt Institute. From headquarters in Pierre, S. Dak., Gregory will serve under the direction of division managing engineer W. L. Hindermann in St. Paul, Minn.; the division encompasses the midwest region from Illinois to Idaho inclusive.

Prior to this appointment, Gregory was state airport engineer in Pierre. He is a member of the South Dakota Society of Engineers and Architects.

Manually operated Sav-A-Life signals stop vehicular traffic at the intersection of a highway and haul road so that a Cat DW20 can roar across the highway on its way to fill areas on Interstate 35 near Des Moines, Iowa. Scrapers generally had the right-of-way. The one operator required for the signal system stands ready to flash the green light to cars as soon as the scraper makes it across.

Signal lights save lives, dollars on big highway grading project

Traffic signal system speeds scrapers moving 700,000 yards of dirt across busy highway

by **BILL ALLEN, field editor**

A traffic signal system proved to be the safest and most economical way to get some 700,000 yards of dirt across a busy 4-lane highway.

In building the grade on Interstate 35 near Des Moines, Iowa, the contractor had the choice of using flagmen or signal lights to control traffic at the intersection of the haul road with heavily traveled Merle Hay Road. The contractor, S. E. Gustafson Construction Co., Sioux Falls, S. Dak., chose to use signal lights.

As it turned out, the choice was a wise one. Four flagmen would have been needed to control traffic at the intersection. With the signal lights, only one man was needed.

The saving in wages was enough to cover the $1,300 that was about the amount needed to buy and install the traffic lights. The more efficient control of traffic shortened haul time and saved the contractor additional dollars.

Although scrapers barreled across the highway night and day during work on this project, there was

On the fills, an Allis-Chalmers Model TS-360 scraper dumps its load while an HD-11 spreads the material. Borrow is being placed alongside a box culvert going under the embankment.

Compaction of the material around the box culvert is done by an HD-11 pulling a Ferguson Model 112 sheepsfoot roller. Altogether, the earthmoving fleets on the job handled some 1.8 million yards of borrow material.

Two tractor-dozers, an HD-20 and an HD-21, were used to push this Allis-Chalmers TS-360 in tough clay. The earthmovers handled a variety of material ranging from soft clay through rock.

Three tractor-dozers were sometimes used to push a scraper in wet, sticky clay. This Euclid SS-24 scraper is being assisted to a full load by three of the Allis-Chalmers HD-21's on the project.

Clay picked up by a Euclid SS-24 is unloaded on the fill. The scraper fleets, handling both soft and wet clay, firm shale, and ripped shale and rock, had to make hauls averaging about 3,000 feet.

only one accident at the crossing. Damage to the car was slight, and no one was injured. It is quite possible that the Sav-A-Life signals, as they are called, actually did save a few lives. During the night, in particular, the lighted red, yellow, and green signals were far more effective than flagmen.

Also adding to the safety of the setup was a well marked and lighted series of signs that warned motorists to reduce their speed as they approached the intersection. The signs started three-tenths of a mile on both sides of the crossing and continued at frequent intervals up to the intersection. Safety cones on the center stripe of the 4-lane highway kept the traffic in line.

Mounted on two posts at diagonal corners of the intersection, the signal lights were plainly visible both to the equipment operator and the drivers of automobiles. When the man operating the signal system saw a scraper approaching, he pushed a button, turning on the green light for the scraper and the red light for the approaching traffic. Normally, operating equipment was given the right-of-way over highway traffic.

Dirt starts moving

Starting work on the $917,000 contract, scrapers worked borrow pits and hauled to small areas on high approach fills. They worked round the clock.

Much of the 2.8 million yards of dirt was borrow material. Since the route at this point followed the lowlands alongside the Des Moines River, the roadway had to be built up with some 1.8 million yards of material borrowed from three pits along the route. Channel relocations and widenings accounted for 700,000 yards of the total.

Scrapers have long hauls

Two fleets of scrapers handled the bulk of the dirt. Hauls were long; they averaged about 3,000 feet, and some went up to two miles. The scrapers hit all kinds of material.

They ate up the soft clay like kids eating popcorn. They chewed their way through the firm shale, plus rock and hard shale. However, a ripper made the stuff more digestible.

In the deeper cuts, the scrapers sometimes ran into wet clay and three hefty push-dozers had to be used to force the sticky stuff into the bowls.

Gustafson worked two fleets of scrapers. One fleet was his own; the other was run by Grady Construction Co., Le Mars, Iowa, which had a sub-

(*Continued on next page*)

(Continued from preceding page)

A Euclid SS-24 heads back empty toward the borrow area. Use of the signal system saved enough in wages of flagmen to take care of the cost of about $1,300 for purchase and installation.

contract for about 700,000 yards.

Gustafson had a colorful fleet. A-C orange pushed Cat yellow and "Euc" green. Supporting equipment was on the lighter side, with a couple of No. 12 blades and two D8 dozers.

Grady liked that A-C orange. His fleet was built around five Allis-Chalmers TS-360 scrapers. An HD-21 and an HD-20 did the pushing, while one HD-11 leveled the fill and another pulled a sheepsfoot.

Channel excavation

Scrapers also handled the bulk of the channel excavation. When the material got too wet to load with scrapers, a Northwest Model 95 dragline did the excavation. The 3-yard rig loaded into four Euclid 13-yard bottom-dumps.

Production on the job varied with the type of material being loaded. On a good day, the two scraper fleets and the dragline moved 24,000 yards during two 10-hour shifts.

Personnel

Leo Nady was the project manager for S. E. Gustafson Construction Co. His superintendent was Harold Timm. William Grady was in charge of the work done by the subcontractor. The resident engineer for the Iowa State Highway Commission was John T. Pearson. THE END

Wheeling Corrugating to erect new plant

Work has started in Southampton, Pa., for a new corrugated-metal culvert-pipe plant and bituminous-coating facilities for Wheeling Corrugating Co., a subsidiary of Wheeling Steel Corp., Wheeling, W. Va. The operation will be part of the company's Philadelphia branch, whose warehouses and offices are 15 miles south of the new plant site.

The half-million-dollar plant is located along the Pennsylvania Turnpike in Bucks County. The plant will serve an eastern section of the country from Massachusetts to North Carolina.

Ebasco to affiliate with Pacific Planning

Ebasco Services Inc., New York City consulting engineering organization, has become affiliated with Pacific Planning & Research, Inc., a city-planning firm with offices in Sacramento and Palo Alto, Calif. The affiliation will provide Pacific Planning with additional resources in related fields. The California firm's two offices will be maintained, and the staff of each will work in conjunction with Ebasco's San Francisco staff.

Bethlehem, Youngstown end merger agreement

The Bethlehem Steel Corp., Bethlehem, Pa., and the Youngstown Sheet & Tube Co., Youngstown, Ohio, have terminated a merger agreement made in December, 1956. The government obtained a Federal District Court injunction against the merger, and both companies ended the agreement in order to permit individual planning for the future.

Ford Division appoints

Donald F. Ball has been named manager of the heavy-truck sales department of the Ford Division, Ford Motor Co., Dearborn, Mich. Ball succeeds John F. McLean, Jr., who has been named executive assistant to the regional sales manager at Ford's Midwestern regional sales office in Chicago.

Convention calendar

April 7-8 Building Research Institute
Eighth Annual Meeting, Penn-Sheraton Hotel, Pittsburgh, Pa. Harold Horowitz, technical secretary, BRI, 2101 Constitution Ave., Washington 25, D. C.

April 7-9 Ohio Highway Engineering Conference
Conference, Ohio State University, Columbus, Ohio. Emmett H. Karrer, professor of highway engineering, OHEC, Brown Hall, Ohio State University, Columbus 10, Ohio.

April 13-17 Greater New York Safety Council
Twenty-ninth Annual Safety Convention and Exposition, Statler Hotel, New York, N. Y. Paul F. Stricker, executive vice president, GNYSC, 60 E. 42nd St., New York 17, N. Y.

April 14-15 Earthmoving Industry Conference
Tenth Annual Conference, Pere Marquette Hotel, Peoria, Ill. R. S. Mills, publicity chairman, EIC, Society of Automotive Engineers, Inc., Central Illinois Section, Peoria, Ill.

April 16-17 American Institute of Steel Construction
Eleventh Annual National Engineering Conference, Dinkler-Tutwiler Hotel, Birmingham, Ala. L. A. Post, executive vice president, AISC, 101 Park Ave., New York 12, N. Y.

April 21-24 High Speed Computer Conference
Conference, Pleasant Hall, Louisiana State University, Baton Rouge, La. B. B. Townsend, conference chairman, HSCC, Mathematics Department, Louisiana State University, Baton Rouge, La.

April 23-25 Texas Aggregate Association and Texas Ready Mixed Concrete Association
Fifth Joint Annual Conference, Shamrock Hilton Hotel, Houston, Texas, Ray L. Cain, executive secretary, TAA-TRMCA, 201 Perry Brooks Bldg., Austin, Texas.

April 29–May 1 American Society of Mechanical Engineers
Conference, Sheraton-Ten Eyck Hotel, Albany, N. Y. L. S. Dennegar, director of public relations, ASME, 29 W. 39th St., New York 18, N. Y.

May 1 Conference for Engineers
Sixth Annual Conference, Mershon Auditorium, Ohio State University, Columbus, Ohio. Marion L. Smith, associate dean, College of Engineering, 120 McPherson Lab, Ohio State University, Columbus 10, Ohio.

May 4-8 American Society of Civil Engineers
Convention, Hotel Cleveland, Cleveland, Ohio. Don P. Reynolds, assistant to the secretary, ASCE, 33 W. 39th St., New York 18, N. Y.

May 6 The Moles
Annual Business Meeting and Dinner, The Biltmore Hotel, New York, N. Y. The Moles, The Biltmore Hotel, New York 36, N. Y.

May 13-15 National Rivers and Harbors Congress
Meeting, Mayflower Hotel, Washington, D. C. William H. Webb, executive vice president, NRHC, 1028 Connecticut Ave. N. W., Washington 6, D. C.

May 18-19 Society of American Military Engineers
Thirty-ninth Annual Meeting, Mayflower Hotel and Naval Ordnance Laboratory, Washington, D. C. Col. F. H. Kohloss, executive secretary, SAME, 808 Mills Bldg., Washington 6, D. C.

May 25-26 Wire Reinforcement Institute
Meeting, The Greenbrier, White Sulphur Springs, W. Va. Frank B. Brown, managing director, WRI, 1049 National Press Bldg., Washington 4, D. C.

May 25-28 Design Engineering Show and Conference
Show and Conference, Convention Hall, Philadelphia, Pa. Banner & Greif, 369 Lexington Ave., New York 17, N. Y.

May 25-30 Concrete Reinforcing Steel Institute
Meeting, The Greenbrier, White Sulphur Springs, W. Va. H. C. Delzell, managing director, CRSI, 38 S. Dearborn St., Room 1625, Chicago 3, Ill.

June 17-20 National Society of Professional Engineers
Annual Meeting, Commodore Hotel, New York, N. Y. C. L. Ritchie, NSPE, 2029 K St. N. W., Washington, D. C.

June 21-26 American Society for Testing Materials
Annual Meeting and Exhibit, Chalfonte-Haddon Hall, Atlantic City, N. J. ASTM, 1916 Race St., Philadelphia 3, Pa.

June 29-July 1 American Society of Landscape Architects
Sixtieth Annual Meeting, Palmer House, Chicago, Ill. Arthur Fitzgerald, general chairman, ASLA, 1119 Pine St., Glenview, Ill.

June 29-July 1 School for Highway Superintendents
School, Riley-Robb Hall, Cornell University, Ithaca, N. Y. James W. Spencer, highway research and extension engineer, SHS, Department of Agricultural Engineering, Riley-Robb Hall, Cornell University, Ithaca, N. Y.

Film on Cat tractor line

"The New D8 Series H," a film released by Caterpillar Tractor Co., Peoria, Ill., follows the development of the new tractor from the engineers' drawing boards through research testing at proving grounds and on-the-job sites. The viewer is given an inside look at how new models come into being, and new features of the Series H are covered.

The color motion picture may be viewed at Caterpillar dealerships.

Pollution-control booklet

"Air-Stream Pollution Control" contains papers delivered at a seminar sponsored by the U. S. Public Health Service, the New Jersey Department of Health, Rutgers University, and American Cyanamid Co. The booklet details the national and the New Jersey air-pollution-control programs; engineering control of air-pollution problems; the national and the New Jersey stream-pollution-control programs; and toxicity studies in stream-pollution investigations.

Copies of the booklet may be obtained by writing directly to H. C. Levin at the American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.

Minus 3-inch subgrade material, filter rock for subgrade drainage, and minor amounts of other materials are produced by the Cedarapids plant for the paving of a 6-mile section of interstate highway in California.

Aggregate setup produc

Interstate grading and paving project requires subbase, base, hot-mix and concrete aggregates, and filter rock

Building a 6-mile section of interstate highway far up in the mountains of eastern California called for a large volume and wide variety of aggregates. Clyde W. Wood & Sons, Inc., North Hollywood, and Kirst Construction Co., Altadena, Calif., the Wood-Kirst Co. joint-venture contractors on the $5 million grading and paving project, set up a plant on the job site to produce all of these materials.

Early in the job, filter gravel was needed to surround the 5,000 feet of 8-inch perforated-metal-pipe subdrains that had been installed to handle the springs and other subsurface drainage. Then a supply of bituminous-concrete aggregate was needed for the paving of a ¾-mile temporary detour to lead traffic around a critical portion of the work.

One of the large-volume items was some 250,000 tons of imported subgrade material (ISM) which provides the foot-thick cushion between the grading section and the base course. Next in order were aggregates for the cement-treated base, concrete pavement, and bituminous shoulders.

Producing this wide variety of materials, as well as having the required supply of each on hand when it is needed, was the job assigned to the big Cedarapids crushing and screening plant set up on the site.

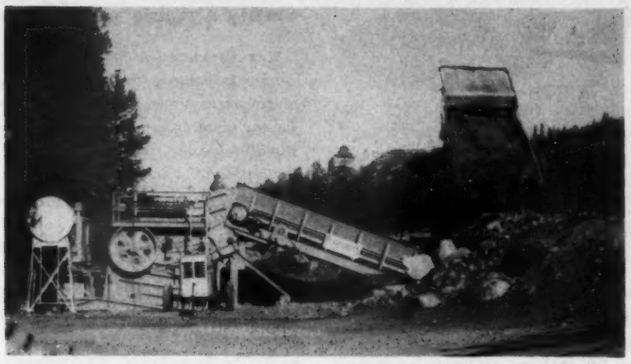
Haul from pit

The source of gravel for the plant was a long narrow deposit, laid down by the Yuba River, which extends from the plant site more than a quarter of a mile down the valley. Wood-Kirst put a 2½-yard Bucyrus-Erie 54-B shovel in the pit to load the gravel into the Euclid end-dumps that hauled to the receiving hopper of the primary crusher.

From the hopper, a 42-inch × 30-foot heavy-duty apron feeder delivered the pit-run material to the 30 × 40 primary jaw crusher. This primary unit was located at the edge of the pit and across the river from the rest of the plant. A 36-inch conveyor carried the gravel from the crusher 200 feet across the river to the No. 1 screen.

From this 5 × 14-foot triple-deck screen, the minus 3-inch material was picked off and sent directly to the ISM stockpiles in the early op-

ariety of materials
or paving operation



Euclid end-dumps hauled gravel as much as one-quarter of a mile from the pit to the receiving hopper of the plant. A Cedarapids 42-inch × 30-foot heavy-duty apron feeder delivers the flow to the 30 × 40-inch primary jaw crusher.

erations. Later, other sizes of aggregate were segregated and sent to their separate stockpiles.

Oversize from the No. 1 screen went to a Symons 4-foot standard cone crusher and then to the No. 2 screen, a 4 × 12-foot triple-deck unit. This screen picked off the filter rock in the early operation and later separated the concrete aggregates. A conveyor returned any desired fraction from this screen to the No. 1 screen.

To produce the sand for the concrete mix, the contractor added an Eagle sand classifier with 36-inch screw 25 feet long and a 20-foot Eagle scalping tank.

Stackers build stockpiles

Most of the 700-tons-per-hour output of the plant was stockpiled by two Kolman stacking conveyors. The largest of these, which handled the ISM, was a 36-inch belt reaching out 120 feet. Carried on four rubber-tire wheels, it was rotated by electric power. The other was a similar machine, but it had a 24-inch belt and was 100 feet long.

Recovery of the ISM from the stockpiles was speeded by two 7-foot recovery tunnels. The 36-inch conveyors in the tunnels brought the material out to a pair of 65-ton-capacity elevated surge bins. The 25-ton truck-trailers hauling this material got their loads from these bins in a matter of seconds.

Since there was always a demand for several types or sizes of materials, frequent adjustments of the plant output were required. However, the large stockpile capacity under the big stackers provided a sufficient reserve so that the plant could always stay ahead of the demands.

Most of the principal plant units were Cedarapids. The two crushers were powered directly by Caterpillar diesels, while most of the other units were electrically driven from transformers on the nearby commercial power line.

Personnel

Frank Wood and Jim Kirst served as joint project managers on this project, with Andy Weesner as superintendent. Gordon Hanna was superintendent of the aggregate-production operation. THE END

For more facts, use Request Card at page 18 and circle No. 258

For more facts, use Request Card at page 18 and circle No. 259

Avoid legal pitfalls

Contractor agreed to restore damaged work

THE PROBLEM: *The roof of a building was damaged under circumstances that left it doubtful whether the damage was due wholly to a storm or in part to faulty construction. The owner and the contractor agreed that the latter would repair the damage and that the owner would pay over to him whatever he should collect on storm insurance policies he carried. The insurance was not paid by the insurers, and the contractor sued the owner for the value of the repair work. Was the owner liable?*

THE ANSWER: No. (Teague v. Edwards, 315 S. W. 2d 950, decided by the Texas Supreme Court.)

Compromise of the debatable point whether the contractor had failed to construct the building according to plans and specifications and thereby caused the damage was a valid consideration for the agreement, regardless of whether the insurer should ever settle.

Annual receipts taxed

THE PROBLEM: *Pennsylvania statute requires payment of an annual school tax of one mill on the dollar of receipts by every person engaged in business in a school district of the first class. This includes Philadelphia. A firm in this district was engaged in designing and supervising construction of sewer and waterworks systems, dams, and bridges outside the city, as well as within. All work was directed from the Philadelphia office, where one-half of the employees worked. The other half worked out of that office and reported there regularly. Was the firm subject to taxation on all of its receipts?*

THE ANSWER: Yes. (Albright & Friel, Inc., v. School District of Philadelphia, 144 Atl. 2d 745, decided by the Pennsylvania Superior Court.)

The court said that there was no double taxation and that no local tax burden was levied on interstate commerce.

Tax lien ruled nonexistent

THE PROBLEM: *A school-building contractor failed to complete a job. His surety took over, paid outstanding claims, took assignments from claimants, and completed the job. When no money remained due from the school district to the contractor, the federal government filed a claim for taxes due from the contractor. Did the claim outrank the surety's claim against the funds in the hands of the school district?*

THE ANSWER: No. (General Surety & Insurance Corp. v. Martin Infante Co., 164 Fed. Supp. 923, decided by the United States District Court, District of New Jersey.)

Surety's rights upheld

THE PROBLEM: *A municipal sewer contract required the contractor to give a performance bond. Application for the bond specified that the surety should have the right, in its sole discretion, to take over the work if in its opinion such action should be necessary, desirable, or proper.*

The city notified the contractor that he had violated the contract in several particulars and that, unless such violations were corrected and ceased within ten days, the contract would be terminated. The principal complaints were that the contractor did not personally supervise the work or have a competent foreman or superintendent on the job; did not have proper tools and equipment; and permitted trench areas to be in dangerous condition for want of cribbing. The contractor disregarded the warning and, in the meantime, removed his equipment. Did the surety properly take over the work, and was it entitled to hold the contractor liable for the consequent expense?

THE ANSWER: Yes. (National Surety Corporation v. Wymore, 90 N. W. 2d 593, decided by the Wisconsin Supreme Court.)

The court said that the surety's right to take over, under the circumstances, was not affected by any question as to whether the contractor inexcusably abandoned the project or was wrongfully dismissed by the city.

Sewer contract severed

THE PROBLEM: *Plaintiff contracted to construct sewers for defendant in the development of a residential subdivision, which was to be laid out in two sections. The work was completed in one of the sections, in which lots had been sold and building was in progress. Plaintiff refused to proceed with work on the second section be-*

cause defendant had not made payments due nor secured necessary permits. Was it a valid defense that the contract involved an indivisible obligation to construct sewers in both sections?

THE ANSWER: No. (Shapiro Engineering Corp. v. Francis O. Day Co., 137 Atl. 2d 695, decided by the Maryland Court of Appeals.)

The court recognized these general rules of law:

Generally, an owner's refusal to pay a contractor a past-due installment justifies the latter in abandoning the contract, even if the contract is divisible. He can then sue for damages which ordinarily are measured by the unpaid contract price, less the cost of completing the job.

If a contract calls for payment when work is completed, it is not rendered divisible by the mere fact that progress payments are provided for.

Because this contract was severable as to the two sections of the project and since plaintiff was justified in refusing to proceed with the second, defendant was not entitled, in the assessment of damages against him, to credit for the excess of completing the sewer in section 2 by another contractor.

Surety had priority

THE PROBLEM: *An Arkansas public-school-building contract called for monthly progress payments with 10 per cent retained until final acceptance of work and payment. The contract also required the contractor to pay all labor, material, and subcontractors' claims. The contractor defaulted after part performance. He owed more to such claimants than was due him under the contract. The contractor's surety paid those claims. Was the surety entitled to reimbursement out of the retained fund, as against a bank to which the contractor had assigned his payment rights to secure loans to enable him to carry out the contract?*

THE ANSWER: Yes, under a governing Arkansas statute. (Exchange Bank & Trust Co. v. Texarkana School District No. 7, 301 S. W. 2d 453, decided by the Arkansas Supreme Court.)

This was so because when the contractor defaulted in performance the surety was bound to complete the work.

Edited by A. L. H. STREET
Attorney-at-Law

These brief extracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

City engineer could practice privately

THE PROBLEM: *Could municipal authorities lawfully permit the city engineer to engage in such private activities as performing engineering services for landowners undertaking housing-development projects, especially where such projects were subject to approval by the city manager, who had appointive and supervisory power over the engineer?*

THE ANSWER: Yes. (Damon v. Slaughter, 101 So. 2d 342, decided by the Mississippi Supreme Court.)

Although the court did not specifically consider the size of the city, the decision is to be read in the light of the fact that it was the city of Meridian that was involved, and not a city so large that its engineer's duties would require all of his time. The decision was also influenced by the absence of any statute or ordinance so worded as to preclude private practice not conflicting with the engineer's official duties.

The suit involved an attempt by local engineers engaged in private practice, in their dual capacity as such and as taxpayers of the city, to enjoin private practice by the city engineer.

The court rejected the argument that the engineer was a public "officer" who might delay approval of projects if he were not employed to prepare the plans. There was no proof that any conflict of interest had actually occurred or that the engineer had not faithfully discharged his duties.

Unlicensed contractors not entitled to sue

THE PROBLEM: *Subcontractors sued prime contractors on the grounds that the latter had failed to provide workmen's compensation liability insurance coverage as had been agreed. Was the suit properly dismissed because the subcontractors were not licensed to do business as required by California state law?*

THE ANSWER: Yes. (Lewis v. Hinman-Ball & Bonner, 316 Pac. 2d 673,

avoid legal pitfalls

decided by the California District Court of Appeal, First District, San Francisco.)

The court noted that under a decision by the California Supreme Court (308 Pac. 2d 713) the unlicensed subcontractors could not collect any pay under their subcontract. However, the evidence showed that, indirectly, they received the benefits of workmen's compensation paid to their employees, even if the insurance taken out by the prime contractors did not technically cover the subcontractors' employees.

Federal wage law

THE PROBLEM: *A federal statute provides that employees on certain government projects shall be paid minimum wages prevailing in the community when a contract is executed, as determined by the Secretary of Labor. A contract specified that wages, determined by the Secretary of Labor after execution of the contract, should be paid on work performed thereafter. Was that provision binding?*

THE ANSWER: Yes. (Bushman Construction Co. v. United States, 164 Fed. Supp. 239, decided by the United States Court of Claims.)

The court ruled that the statute does not authorize increase of wage rates as determined belatedly by the Secretary of Labor but that a contract permitting such increase, without increase in the contract price, was not invalid.

The right to pay for partly done work

THE PROBLEM: *A subcontract required filling at a lump-sum price, but the prime contractor had part of that work done by a third party. The subcontractor could have disregarded the contract price and sued for the reasonable value of his work, but, instead, he sued to collect the full contract price. Was he entitled to collect that price without deducting what it would have cost him to do that part of the filling that was taken away from him?*

THE ANSWER: No. (Tower Contracting Co. v. Flores, 294 S. W. 2d 266, decided by the Texas Court of Civil Appeals, Galveston.)

The decision involved applying the general rule of law that, so long as a contract remains wholly or partly unperformed, either party can terminate the agreement—even if that is a breach of contract. The aggrieved party merely has a right to claim damages measured by the loss resulting from being prevented from completely performing the work.

The court added that it was up to the subcontractor, not the prime contractor, to prove what it would have cost him to do the filling that he was prevented from doing.

Substituting materials

THE PROBLEM: *Municipal building contract specifications called for the use of sand plaster. The contract permitted the architect to approve a substitution of materials as good as or better than those specified. Another paragraph required the contractor to make good defects in work or use of improper materials discovered within one year after final payment of the contract price.*

Under state law, ordinarily, a suit for damages for breach of a contract may be started within six years after the date of the breach. More than four years after the final payment, the city sued for damages on the ground that the substituted plaster was inferior to that specified. Was the suit properly dismissed as having been started too late?

THE ANSWER: Yes. (City of Seattle v. Kuney, 311 Pac. 2d 420, decided by the Washington Supreme Court.)

Rights of associations

THE PROBLEM: *A local general contractors' association and a chapter of the Associated General Contractors of America sued various state officials to compel a determination of wage scales to govern public works in accordance with statutory provisions. Since neither association was an employer of construction labor and both were associations of contractors, was the suit properly dismissed?*

THE ANSWER: Yes. (State on relation of General Contractors Association of Akron et al. v. Wait et al., 150 N. E. 2d 851, decided by the Ohio Supreme Court.)

The court said that the associations as such had no beneficial interest in having wage scales determined, because neither was engaged in the contracting business.

In another case, the Illinois Supreme Court found it unnecessary to determine whether a concrete contractors' association could maintain a suit attacking the validity of municipal ordinances imposing license fees upon concrete contractors. The decision was rendered unnecessary because five contractors, individually affected by the ordinance, were co-plaintiffs in the suit. (Concrete Contractors Association of Greater Chicago v. Village of LaGrange Park, 150 N. E. 2d 783.)

Army engineers develop shelter for missile

A weatherproof shelter, designed to cover the lower portion of the Jupiter rocket and create a watertight seal that protects instruments and equipment until firing, has been developed by the U. S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va.

The shelter has twelve 30-foot aluminum panels that are shaped like the petals of a flower. After installation, the panels radiate from a circle around the missile. When preliminary adjustments on the missile are completed, synchronized motors raise the panels, closing them around the rocket. When the missile is ready for firing, electronic equipment causes the panels to open up and return to the ground.

Doors in the 30-foot sections allow workers to go inside for inspection of the launching apparatus. Other openings carry fuel lines to the missile. The interior of the shelter is coated with a paint capable of resisting temperatures of over 1,000 degrees F.

Report on highway design, vehicle characteristics

Highway Research Board Bulletin 195, "Relation Between Vehicle Characteristics and Highway Design: A Symposium," is available for $1 from the HRB, 2101 Constitution Ave., Washington 25, D. C.

Three topics are discussed. Driver eye height and vehicle performance in relation to crest-sight distance and length of no-passing zones is presented from the viewpoints of vehicle data, vertical curve design, and driver passing practices. Passenger-car overhang and underclearance as related to driveway profile design is discussed from the viewpoints of vehicle data and street and highway design. Passenger-car dimensions as related to parking space is observed from the viewpoints of vehicle data and parking-facility design.

Union Metal reorganizes

The Lake States and the Allegheny sales districts of The Union Metal Mfg. Co., Canton, Ohio, have been reorganized. W. B. Vick, former manager of the Lake States district, has been appointed a special representative to work with state and municipal governments throughout the area. C. F. Clark, Vick's assistant, will now take over as district manager of that territory.

M. J. Vitartas, manager of the Allegheny district, adds eastern Ohio to his present territory of West Virginia, western Pennsylvania, and western New York.

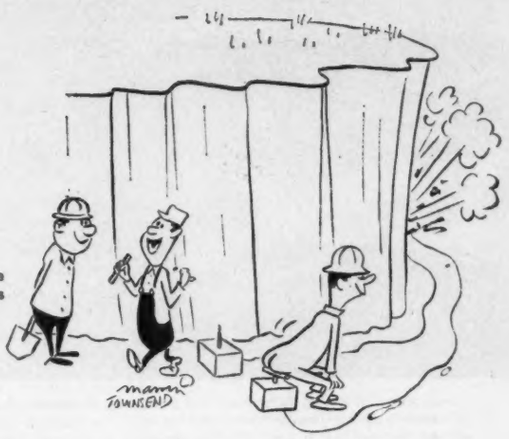
Through its West Coast subsidiary, Pacific Union Metal Co., Los Angeles, the firm has established a sales office at 127 Montgomery St., San Francisco. The office will serve northern California and northern Nevada. Charles G. Strom is manager.

ARBA lists teaching aids for highway construction

A "Catalog of Highway Construction Teaching Aids" is available from the American Road Builders' Association. The catalog lists sources of engineering data, descriptive circulars, manuals on operations and applications, motion pictures and models of construction machinery, and materials.

Technical bulletin No. 237 may be ordered for $1 per copy from the ARBA, World Center Bldg., Washington 6, D. C. ARBA members in good standing are entitled, upon request, to one free copy.

The New York State Thruway Authority received $34,908,051 for 1958, a 12.37 per cent increase over 1957.



"Wait'll that wise guy sets off this one!"

Construction of timber falsework and pouring of concrete go on simultaneously during work on the thin-shell-arch and prestressed-girder bridge across the Fox River on the Illinois Toll Highway. A Bucyrus-Erie 38-B, right, is setting oak piles into place to support forms for an arch. At left, the concrete crew completes a pour at the crown of another arch.

Time element dicta

(Additional photo on front cover)

Some interesting construction techniques are bound to evolve when a contractor starts work on a bridge that is one of the first of its kind in the country.

This was the case with the new $2.2 million thin-shell-arch and prestressed-girder bridge that is a show piece of the Illinois Toll Highway.

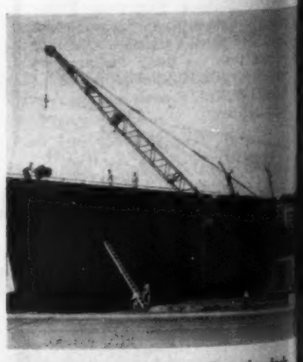
The 1,327-foot bridge, with 172.5-foot arch spans, marks the west terminal of the East-West Tollway route, carrying traffic over the Fox River, the Burlington and the Northwestern rail lines, and Illinois Route 25 north of Aurora. The five 172.5-foot arch spans are flanked on the east end by four prestressed-girder spans and on the west end by two similar spans.

The spans vary in length from 46 to 88 feet. The 68-foot 4-inch overall width of the bridge is used by four lanes of traffic that are separated by a 4-foot concrete mall. The bridge was designed by Vogt, Ivers, Seaman & Associates, Cincinnati, and the general contractor, CKG Associates, was a combine made up of Contracting & Material Co., Evanston, Ill.; Kenny Construction Co., Skokie, Ill.; and Louis Garavaglia, Center Line, Mich. This combine has handled some $40 million worth of work on the toll highway.

Alternative methods

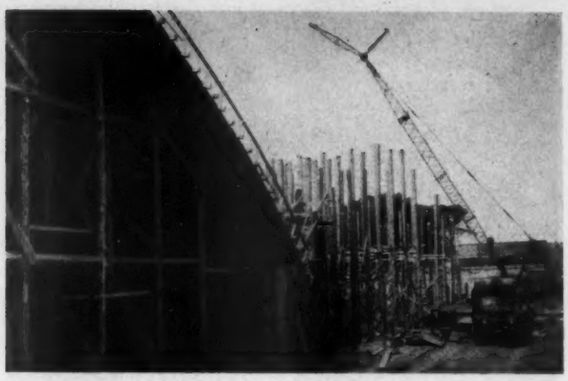
Although the job went according to plan for CKG Associates, the setting of the falsework piles and the placing of the concrete for the arches required careful and precise work.

Falsework structures under each arch had to be held in place until all five arches were built. This method of construction was necessary because the group of arches was dependent for its support on the two anchorage piers. The piers, located at each end



Reinforcing steel is hoisted to the deck of one of the prestressed-girder spans by a Bucyrus-Erie Model 51-B.

ethod of constructing thin-shell arch bridge



The B-E 38-B is also used to place concrete for the individual footings under each pile. The oak piles under the arch at left are bolted together with cross bracing and topped by transverse 6 × 12's. Along the length of the arch are 12 × 12's, cut in a California mill to fit the curve.

of the group, resisted the horizontal thrust of the arches. A single arch could not support itself.

Although the contractor decided against it, there was an alternative method of construction. Rather than keep all five arches supported with falsework piles, it would have been possible to resist the horizontal thrust of the arches with temporary H-piles. Driven on a batter, the H-piles would have been braced against the outer sides of the intermediate piers. With the H-piles resisting the horizontal thrust, the falsework could have been removed, then used to build the adjoining arch. This method was not used because there was not enough time to erect and dismantle the arches in succession and still meet the completion date.

Start at the bottom

For the arch spans, the spread footings of the piers are set in 5 to 8 feet of rock. A wall-type pier, 6×68 feet in cross section, rises up from the footing to meet the arch. The largest of the footings for the two anchor piers, which also rest on rock, contains 580 cubic yards of concrete. Although putting in the footings was no great problem, the operation was hampered by ground water flowing through faults in the rock.

Building the falsework to support the arches took a lot of time and care. Each of the 170 oak piles under each arch had to be set 2 feet into rock and concreted in place. Since the tops of the piles received timbers precut to fit the arch, the piles had to be lined in and cut to grade with precision.

Bolted together with cross bracing,

A crew positions a Blaw-Knox bucket ready to place concrete for a pile footing. It was impossible to drill footings into rock here because of an underground water condition.

Concrete is dumped for one of the eight main pours used to complete the arch. Each pour covers half the width of the arch and about a quarter of the total length.

(Continued from preceding page)

the oak piles were capped with transverse 6×12's. These transverse members received 12×12's that were precut in a California mill to fit the arch. The decking was made up of plywood supported by 3×8's on 15-inch centers. All major connections in the falsework structure were bolted for rigidity and strength.

Balanced pours

Placing the concrete on the arch also required a considerable amount of care. To balance the load on the falsework, crews had to place concrete on each side of the arch at the same time. The entire arch was poured in eight major sections—four on each side. To allow for shrinkage of the concrete, 3-foot-wide gaps were left between pours across the width of the bridge. These were filled

Two cranes work together to balance pours on an arch. The Bucyrus-Erie 51-B is swinging a Blaw-Knox bucket to the crown, while a crane works from the opposite side. The Willys pickup, foreground, carries field testing equipment. Five 172.5-foot arch spans comprise the center of the 1,327-foot bridge.

in after the adjoining concrete had set for at least three days.

The bridge is divided into two sections along the length of the arch by a permanent ½-inch open joint. The thickness of the concrete in the arch varies from 20 inches at the base to 14 inches at the crown.

The concrete was placed by two cranes that bucketed the concrete to opposing sections of the arch. A Bucyrus-Erie 51-B and a Northwest Model 95 swung their 1½-yard buckets from Worthington transit mixers to the forms. After Maginniss and Homelite electric vibrators consolidated the concrete, it was screeded, floated, and given a brush finish. On the steeper sections of the arch, it was necessary to form both sides of the concrete.

The contractor's Erie Strayer batch plant kept pace with the pouring of the arches. For this part of the construction, the 6¾-sack mix was designed to give a 4,400-pound test at 28 days. Darex was added to the mix to yield 4 per cent air entrainment.

Spandrel walls rise from arches

In the pouring of the arches, stub ends with dowels were formed to receive the spandrel walls. The 12 to 8-inch-thick walls rise vertically to support the concrete deck. Formwork for the deck was supported by shores resting on the curving surface of the arch.

It was only after the last arch had been completed that the supporting falsework was removed from under the bridge. Falsework dismantling started after the last of the deck pours was finished and the deck had reached its required 28-day curing time. The arches were decentered one at a time, with crews starting at the abutment piers and working toward the crown as they removed the wedging beneath the block supporting the precut 12×12 beams. As soon as the

(Continued on page 87)

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At $30,000,000 Sutton Dam, Gulf fuels and lubricants he

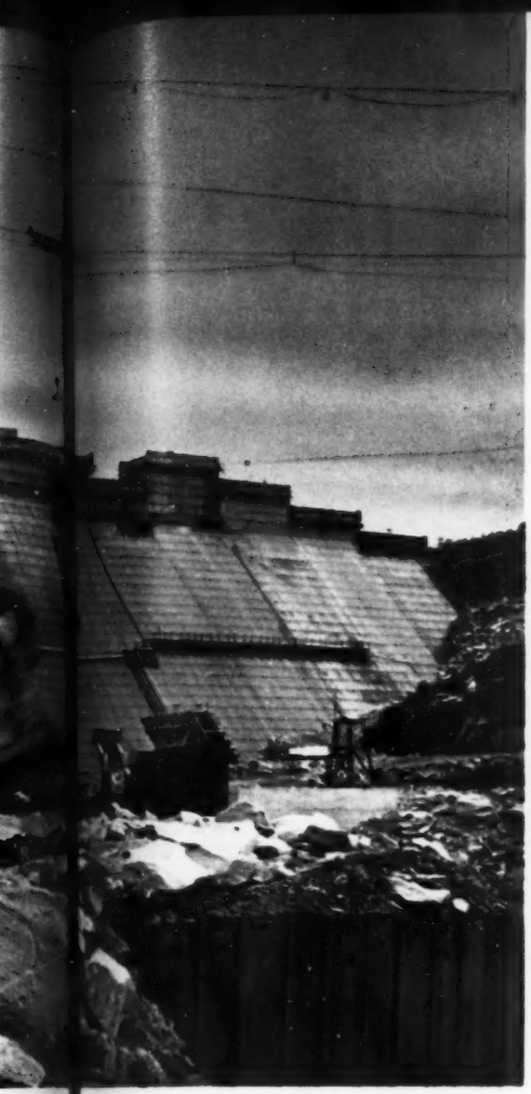
GULF MAKES THINGS

"Our dozers, cranes, power shovels and dump trucks have been running on Gulf fuels and lubricants for over 2 years on this project. We're right on schedule, and we haven't had a mechanical delay attributable to fuel performance or lubrication in any of this equipment."

That's the report from Leon H. "Freck" Freckleton, Mechanical Superintendent of the Arundel-Dixon-Hunkin team of contractors now in their third year of building the new $30,000,000 Sutton Dam project on the Elk River near Sutton, West Virginia.

The joint contractors, working under the supervision of Mr. J. H. Hay, General Superintendent, are: Arun Construction Co. of Baltimore, Md.; L. E. Dixon C struction Co. of San Gabriel, Calif.; and the Hun Conkey Construction Co. of Cleveland, Ohio.

The new Sutton Dam is another vital link in the f control system for the Ohio River Basin. It is a pro of the First Corps of Engineers, U.S. Army. In the e of flood conditions, this dam is expected to keep crest of the Elk River to 13 feet, as compared with foot crest that caused 21 million dollars damage in disastrous flood of 1861.



On-the-job lubrication at Sutton Dam project. Here a lube truck pulls up to a dozer for a track lube job with Gulflex A, a lithium base multi-purpose grease that resists heat, water, oxidation, rusting.

J. H. Hay, right, General Superintendent at Sutton Dam project, discusses fueling and lubricating schedules with John Hindsley, Gulf Sales Engineer.

keep project on schedule . . .

RUN BETTER!

Over 380,000 cubic yards of earth and rock will have been moved—and more than 610,000 cubic yards of concrete placed—when the dam is completed late in 1959. Since the project started in November 1956, Gulf fuels and lubricants have racked up an unusual record of trouble-free performance and operating economy.

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SP-9494

A workman checks the support for the forming of a cantilevered section of the deck of the prestressed-girder span, along the outside girder. He is tightening the screw-type connection on the steel bar that extends diagonally down from the top of the hanger to a double-wale that supports bracing for the cantilevered deck section.

(Continued from page 82)

arches were decentered—a job that took about a week—the structure was ready for traffic.

The joists, meanwhile, were stripped from the ¾-inch plywood forms, the 12×12 beams dropped to the ground, and the piling caps removed and dropped to the ground.

The sway bracing removal was coordinated with the cutting of the piles from their concrete footings. Piles were plucked from beneath the arch by a Northwest Model 95 crane.

Personnel

On the job for CKG were superintendent Andy Speer and engineer Bill Miller. Supervision of bridge construction for the Illinois Toll Highway Commission was handled by Robert M. McDowell, project engineer for Vogt, Ivers, Seaman & Associates. THE END

Pole-type buildings topic of revised manual

The second edition of "How to Design Pole-Type Buildings" is available for $1.50 from the American Wood Preservers Institute, 111 W. Washington St., Chicago 2, Ill. Illustrations and text show how to compute live, dead, and wind loads, and stresses for every structural member of a proposed pole-type building. An embedment chart, tables, and text enable users to calculate required pole depths to handle anticipated maximum loads and stresses.

Also presented in the book are procedures for proportioning structural members of pole-type buildings of all sizes and for many uses.

Hobart offers new film

"From Sea Sands to Better Welding," a film produced by Hobart Bros. Co., shows the steps involved in mining rare and valuable minerals for electrode coatings from the sands of Florida. The 16-mm sound and color movie runs 18 minutes.

The film is loaned, free of charge, by the company, Box DM-95, Hobart Square, Troy, Ohio.

LOOSE ROCK UP TO 6 FEET IN DIAMETER is loaded into a Koehring Dumptor to be used as fill for a new 4-lane right-of-way on a relocation of U. S. 41 at Monteagle, Tenn. The 5-mile stretch, consisting of a gradual 180-degree curve with no grade exceeding 5 per cent, replaces a hazardous 2-lane corkscrew road that winds down Monteagle Mountain.

Sandy soil at the Nike missile site at Selfridge Air Force Base near Detroit, Mich., is compacted to 95 per cent modified Proctor by a Lima Roadpacker.

Contractor licks problem of compacting fine sand to high density

Packing a sand subbase for a 65,000-square-foot paved launching site for Nike anti-aircraft missiles at Selfridge Air Force Base near Detroit, Mich., proved to be one of the toughest compaction jobs that Stolaruk Asphalt Paving, Inc., had ever encountered. About 85 per cent of the sand was finer than 200 mesh; 1 per cent of it was clay. Yet it had to be compacted to a specified density of 95 per cent modified Proctor.

The Oak Park, Mich., paving contractor, working on a $55,000 subcontract—part of a $278,000 contract awarded by the Detroit District of the U. S. Army Corps of Engineers to Roth, Wadkins & Wise, Detroit—had the job of doing bituminous paving and granular subbase work at four Nike sites. At the Selfridge site, everything that rolled onto the sand sank—automobiles, a tandem truck, road rollers, and a vibrating roller.

After trying various equipment, Stolaruk found that a Lima Roadpacker worked best in the sand. The unit's six sledlike vibrating shoes are hydraulically controlled and actuated, thus permitting the system to be sealed so that the machine will operate at full efficiency even if the shoes are covered with sand.

Two 6-inch layers of granular fill over a clay and sand subgrade were laid. After some 3,500 yards of sand was put down, about 2,700 yards of stabilized road gravel was used to build a third 6-inch layer, for a total subbase depth of 18 inches. The gravel had to be packed to a density of 100 per cent modified Proctor, or better. The Roadpacker, which operates in forward or reverse, compacted both the sand and gravel; it brought the sand to the required density in four passes. Compaction work progressed at the rate of 50,000 square feet per day.

HRB bulletin analyzes highway needs of 1958

Highway Research Board Bulletin 194, "Highway Needs Studies 1958," contains seven papers. Topics discussed are what highway-needs study reports should contain; a highway taxation cost-benefit analysis; Indiana's highway-needs study; and an analysis of county-road management functions.

The last three papers cover traffic growth patterns on rural highways; vehicle delay at signalized intersections as a factor in determining urban priorities; and Tennessee's programming study: first year's experience and techniques for updating. Tables and graphs are included.

Priced at $1.20, the bulletin may be purchased from the HRB, 2101 Constitution Ave., Washington 25, D. C.

Sinclair names engineer

Marion L. Rensink has been appointed a sales engineer for the Sinclair Refining Co., a subsidiary of Sinclair Oil Corp., New York City. He will work out of the St. Louis, Mo., district office, covering the eastern two-thirds of that state.

PRODUCT PARADE

For further information on any of the products described in the following section, circle the designated number on the Request Card at page 18.

Two new asphalt finishers are announced

Barber-Greene announces two new asphalt finishers: the Model SA-60, which is mounted on special high-speed tractor-type crawlers; and the Model SB-60, with pneumatic-tire mounting.

Both machines are said to offer a selection of speeds from 14 fpm to 12 mph, in both forward and reverse.

On the SA-60, the crawlers are 3 feet high. An auxiliary set of small, idler crawlers support the receiving hopper and feeders on both models. These crawlers, together with the feeders and screed unit, are raised hydraulically and simultaneously for travel. Also, the wheels or crawlers are set well within the machine's normal laying width to facilitate such operations as matching joints and working next to curbs.

The hopper design is such that the entire 13-foot length of the finisher's chassis becomes the hopper. Three individually controlled gates are located at the rear of the chassis and can be controlled by the screed man without interruption in machine operation. Independently controlled feeders and spreading screws are provided for each side of the machine, the manufacturer reports.

According to the manufacturer, the crawler-mounted SA-60 may be converted to the rubber-tire SB-60 and vice versa.

For further information write to the Barber-Greene Co., Dept. C&E, 400 N. Highland Ave., Aurora, Ill., or use the Request Card at page 18. Circle No. 115.

Backhoe features five digging positions

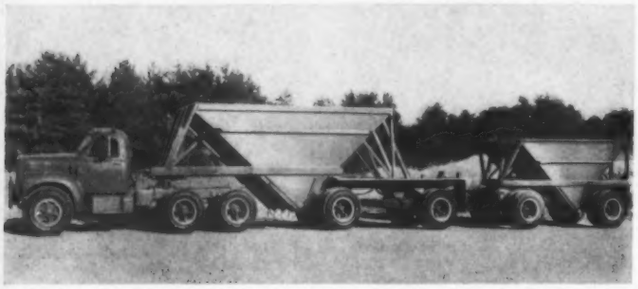
The Davis Model 220 backhoe, with Hydra-slide positioning to any one of 5 digging positions, is available from the Massey-Ferguson Industrial Division.

Other improvements include increased operating pressure to 2,150 psi, a larger bucket cylinder for up to 50 per cent faster dumping, and a breakaway power up to 14,000 pounds.

The Model 220 is said to permit one man to move the entire digging assembly along the frame to any one of the 5 positions in less than 5 minutes.

The Davis backhoe attaches directly to the Davis loader and utilizes the same hydraulic system. It is available for all Massey-Ferguson tractors, including the Work Bull 202 and 303, the Ferguson 35, the Massey-Ferguson 50 and 65, as well as utility models of Ford, International, Allis-Chalmers, and Oliver tractors.

For further information write to the Massey-Ferguson Industrial Division, Dept. C&E, 1009 S. West St., Wichita, Kans., or use the Request Card at page 18. Circle No. 116.



On the Fisher spreader, pressure-controlled tension of the spreader gate permits spreading rates from 50 to 100,000 pounds of material per mile, with rates varied instantly from the cab.

Material spreader offers variable-rate feature

A material spreader featuring a regulated-air-pressure principle that permits the operator to choose any spreading rate he desires is available from Fisher Mfg., Inc.

Pressure-controlled tension of the spreader gate facilitates spreading rates from 50 to 100,000 pounds of sand, salt, chips, and chloride per mile, with rates varied instantly from the cab. In addition, the unit is quickly convertible for cab-controlled gravel spreading.

Live trailer axle-type power offers a simple and reliable driving mechanism, the manufacturer points out. Other features include an obstruction-free hopper and a large discharge gate.

For further information write to Fisher Mfg., Inc., Dept. C&E, W. High St., Mount Pleasant, Mich., or use the Request Card at page 18. Circle No. 61.

Compressor for permanent or temporary usage

Atlas Copco announces a new air compressor delivering 1,075 cfm at 100 psi.

Called Model ER-6, the unit weighs 6,600 pounds and may be installed either as a stationary unit or mounted on a skid frame as a semiportable machine for temporary use.

Compact in design, the machine is said to require a minimum amount of floor space. The ER-6 also features a lubricating system which requires oil replenishment only once every three weeks.

For further information write to Atlas Copco Eastern, Inc., Dept. C&E, 610 Industrial Ave., Paramus, N. J., or use the Request Card at page 18. Circle No. 37.

Tractor transmission eliminates clutch pedal

A tractor transmission that can be shifted on the go without use of a clutch pedal, and that has 10 forward and 2 reverse speeds, is announced by the Ford Motor Co.'s Tractor and Implement Division.

According to the manufacturer, shifting from one gear to another is a simple matter of "dialing" the desired gear ratio with a small hand-controlled lever just below the steering wheel. Speeds range from ½ to 18 mph. The transmission can be completely disengaged when the tractor is being towed to job sites.

An inching control pedal, located where the foot clutch normally is found, permits the tractor to move under precise control for hooking up implements or maneuvering in tickliish situations. Also, the operator can preselect any of five gears and set stops for the ones desired in such shuttle operations as loading.

For further information write to the Ford Motor Co., Tractor and Implement Division, Dept. C&E, 2500 E. Maple Road, Birmingham, Mich., or use the Request Card at page 18. Circle No. 25.

Versatility is feature of new wheel tractor

The Model 660 wheel tractor, with an estimated 75 horsepower at the belt and 68 at the drawbar, is announced by the International Harvester Co. The machine is powered by a 6-cylinder valve-in-head gasoline engine; diesel and LPG engines also are available.

The tractor reportedly can pull sheepsfoot rollers equivalent to those used with a crawler tractor of the 100-drawbar horsepower class. It is built to work with a ¾-cubic-yard International Wagner front-end loader, and can be equipped with International Wagner and Pippin backhoes with a 14½-foot working depth.

Top speed of the unit is 16.5 mph under load, with higher speeds possible when it is free of attachments.

Four models of the Johnson elevating scraper, with 4 to 8-cubic-yard capacities, are designed to work with the Model 660.

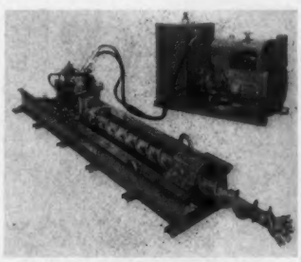
For further information write to the International Harvester Co., Dept. C&E, 180 N. Michigan Ave., Chicago 1, Ill., or use the Request Card at page 18. Circle No. 94.

International Harvester's newest and largest wheel tractor, the Model 660, can perform a wide variety of digging and material-handling operations when equipped with backhoe and front-end loader. The 6-cylinder tractor also is recommended for pulling 4-wheel scrapers and sheepsfoot rollers.

New line of trench drills aids in pipe-laying work

A new line of trench drills is announced by The Salem Tool Co.

In practice, the drill operates in a trench dug to the depth at which the pipe is to be laid. The drill is placed in the trench with a side-boom tractor or a truck-mounted



winch. The auger rotates inside the pipe and advances the pipe as the hole is drilled. The auger flights feed the drilled earth back through the pipe. Additional augers and pipe sections are added as the hole is bored and the pipe advanced.

The drills handle augers from 4 to 24 inches in diameter and 2 to 6 feet in length. All drills have variable hydraulic feed installed in a rigid frame for drilling accuracy.

For further information write to The Salem Tool Co., Dept. C&E, 769 S. Ellsworth Ave., Salem, Ohio, or use the Request Card at page 18. Circle No. 59.

New rubber waterstop for concrete joints

The Presstite-Keystone Engineering Products Co., a division of American-Marietta Co., announces a new rubber waterstop said to provide absolute watertightness under hydrostatic pressure in concrete expansion, contraction, and construction joints.

Designated Aquastop, it is available in several standard sizes in flat-dumbbell, split-dumbbell, center-bulb, and split-center-bulb types. Molded accessories such as tees, els, crosses, and unions are available.

For further information write to the Presstite-Keystone Engineering Products Co., Dept. C&E, 39th and Chouteau Aves., St. Louis 10, Mo., or use the Request Card at page 18. Circle No. 58.

Shoulder spreader offers spreads up to 12 feet

The ULMac Equipment Co., Inc., announces the new Model U-500 shoulder spreader, designed to attach quickly and easily to any Caterpillar No. 12 or 112 motor grader.

Spreads to 12 feet can be made easily and accurately with any spreadable material including hot-mix, according to the manufacturer.

Depth of spreads can be adjusted from 6 inches above to 18 inches below pavement level.

The U-500 features 4-wheel suspension with solid rubber tires. All wheels are adjustable to permit varying the machine height from the pavement.

The U-500's 9-foot dump hopper is said to accommodate the largest dump trucks. A 50-hp Wisconsin Model VR-4D air-cooled engine drives the conveyor through a Twin Disc clutch and reduction unit and a roller chain drive to the conveyor head pulley.

For further information write to the ULMac Equipment Co., Inc., Dept. C&E, El Paso, Ill., or use the Request Card that is bound in at page 18. Circle No. 101.

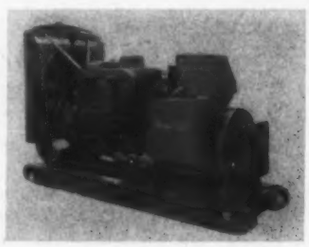
Designed to attach quickly and easily to the Caterpillar No. 12 or 112 motor grader, the ULMac Model U-500 offers spreads up to 12 feet. Depth of spreads can be adjusted from 6 inches above to 18 inches below pavement level.

Diesel electric plants in capacities to 200 kw

Eight new series of diesel-driven electric generating plants, from 50,000 to 200,000 watts, are announced by D. W. Onan & Sons, Inc.

Each plant is designed with the engine, alternator, exciter, and control panel assembled in a compact unit.

Prime movers for units of up to



150,000-watt capacities are Cummins diesel engines. In the two larger sizes, 175-kw and 200-kw, the driving engines are Waukesha diesel units.

A complete selection of optional accessories, including automatic line transfer, is available for each model.

For further information write to D. W. Onan & Sons, Inc., Dept. C&E, 2515 University Ave. S. E., Minneapolis 14, Minn., or use the Request Card at page 18. Circle No. 34.

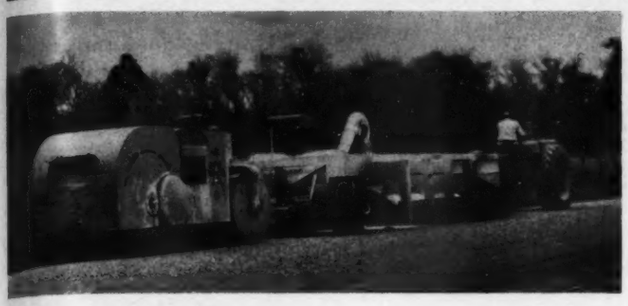
Pipeline, cable-laying ripper for I-H tractor

A new Ateco pipeline or cable-laying ripper for use with International Harvester TD-24 tractors is announced by Greenville Steel Car Co.

The standard unit, Model HR48, reportedly will rip to a 48-inch depth. The Super Pipeliner, Model HR72, will go as deep as 72 inches. The heavy-duty swing bracket will also handle the Ateco curved shank and various sizes of straight shanks. The tool beam will accommodate standard Ateco swing brackets.

A heavy-duty booster attachment permits the use of a push-tractor. The design of the big pipeliner allows the shank to follow the tractor easily and permits easy steering, states the manufacturer.

For further information write to the Greenville Steel Car Co., Dept. C&E, Greenville, Pa., or use the Request Card at page 18. Circle No. 30.



A new-type surface heater is shown in use by the Dew Construction Co. of Tyler, Texas, heating cover stone on a double-surface asphalt paving job. On this job, the heater was used after the stone was applied to the freshly shot surface. The heater, made by the W. E. Grace Mfg. Co., is oil-fired and features a heating pan measuring 20 feet long and 8 feet wide. When towed by a tractor traveling at 1 mph, the unit offers temperatures varying from 50 to 250 degrees; temperatures are higher at slower travel speeds. According to the manufacturer, the surface is heated to a depth of ½ inch or more and retains the heat for approximately 5 minutes. For further information write to the **W. E. Grace Mfg. Co.**, Dept. C&E, 6000 S. Lamar St., Dallas 15, Texas, or use the Request Card at page 18. Circle No. 55.

Power source for welding offers up to 1,600 amp

The Miller Electric Mfg. Co., Inc., announces a new power unit which delivers 1,000 amp of dc at 40 volts on a 100 per cent duty cycle. Used with 3-phase power lines, the Model

SR-1000-A1 features the firm's completely sealed semimetallic rectifier.

Single current range adjusts output from a minimum of 200 amp to a maximum of 1,600. This model is especially recommended for heavy submerged-arc welding, the plasma jet process, and Arcair gouging. It is said to require less than 9 square feet of floor space.

For further information write to the Miller Electric Mfg. Co., Inc., Dept. C&E, 718 S. Bounds St., Appleton, Wis., or use the Request Card at page 18. Circle No. 91.

Portable electric drill offers increased power

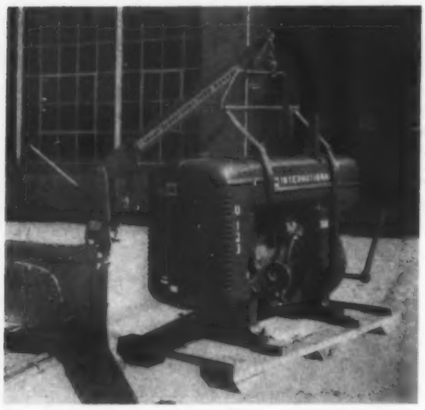
The Black & Decker Mfg. Co. announces a new ½-inch portable electric drill.

Designated No. 679, the unit is said to have a 62 per cent power increase over previous models. Powered by a Black & Decker drill motor, it drills diameters up to ½ inch in steel, ¾ inch in masonry, 1 inch in hardwood; it drives hole saws up to 2 inches. Weighing 7½ pounds, it is compact and close-coupled for maximum efficiency.

Other features include a geared chuck and key, 3-conductor cable and rubber key-holder, and "instant-release" trigger switch.

For further information write to the Black & Decker Mfg. Co., Dept. C&E, E. Pennsylvania Ave., Towson, Md., or use the Request Card at page 18. Circle No. 21.

For more facts, circle No. 277→

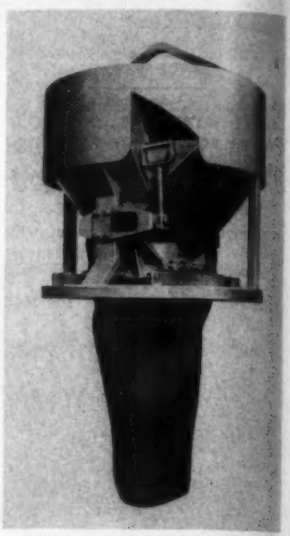


Capable of lifting 1,500 pounds with a 44-in boom, this one-man-operated hydraulic Ideal crane is available with either inside or outside truck mounts as standard equipment. A floor dolly is also available for shop use. Interchangeable design is an important feature. For further information write to the **Ideal Crane Co.,** Dept. C&E, P. O. Box 516, Wichita Falls, Texas, or use Request Card at page 18. Circle No. 69.

Concrete bucket allows one-hand gate operation

A new lightweight concrete bucket, available in ½, ¾, 1, 1½ and 2-cubic-yard sizes, is available from the C. S. Johnson Co.

This cone-shaped bucket is designed with all working parts above



the discharge point and within the bucket outline to protect them from falling materials.

According to the manufacturer, the 50-degree slope of the bucket assures complete discharge of medium-slump concrete. The geared handle that operates the gate assembly provides leverage with a short stroke, permitting one-hand gate operation.

For further information write to the C. S. Johnson Co., subsidiary of Koehring Co., Dept. C&E, P. O. Box 71, Champaign, Ill., or use the Request Card that is bound in at page 18. Circle No. 113.

Single unit offers 3 types of compaction

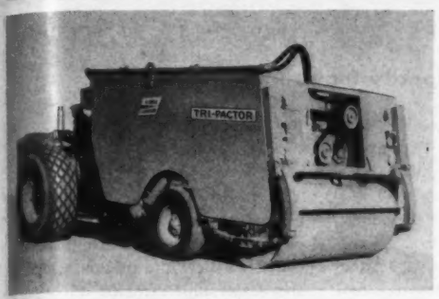
The Seaman-Gunnison Corp. announces a machine offering three compaction techniques combined in one unit: pneumatic compaction, smooth steel rolling, and heavy-impact vibratory compaction.

Designated Tri-Pactor Model 7-19 TRI, the unit has a ballasted weight adjustable from 7 tons empty to 19 tons fully loaded. The loading intensity is hydraulically controlled up to the equivalent of a 50-ton surface-pressure rating.

The vibrator element is powered by a 20-hp hydraulic motor. The element rotates transversely to forward travel, which results in impact directed vertically only; and it delivers a compaction force in excess of 12 tons.

The Tri-Pactor's pneumatic-roll unit consists of eight closely spaced compaction tires mounted in pairs on torsion springs for controlled oscillation. These tires are capable of pressures up to 100 psi. The steel roll is 72 inches wide and has a 31-inch diameter.

The prime mover is integral with the Tri-Pactor, and is available with



At the shift of a hydraulic lever, the operator of the Seaman-Gunnison Tri-Factor can select any one or a combination of techniques for high-speed compaction.

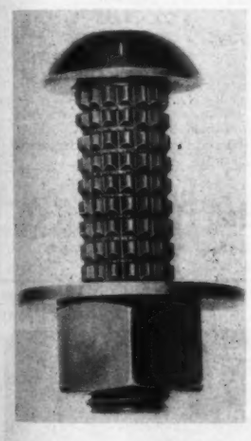
gasoline or diesel engine. It reportedly is interchangeable among the Tri-Factor, Duo-Factor, and the firm's 6-cubic-yard utility scraper.

For further information write to the Seaman-Gunnison Corp., Dept. C&E, 2763 S. 27th St., Milwaukee 15, Wis., or use the Request Card at page 18. Circle No. 11.

New high-tensile bolt for structural joints

A new-type high-tensile structural rib bolt with rolled interrupted ribs, said to give a high clamping force and a body-bound fit in a structural joint, is available from the Automatic Nut Co.

According to the manufacturer, the bolt is designed with the proper



length of rib for the thickness of the plates, thus preventing the riding of any steel on the bolt threads; the full thickness of the plates is in full bearing at all times.

The flat head of the bolt and the taper at the start of the ribs permit easy driving. The bolt can be driven in misaligned holes with a 3-pound hammer or can be pulled in with the nut.

For further information write to the Automatic Nut Co., Dept. C&E, 16th and Willow Sts., Lebanon, Pa., or use the Request Card at page 18. Circle No. 68.

To obtain further information on any of the products described in this section, circle the number given at the end of the item on the handy Request Card that is bound in at page 18 of this issue.

New air impact wrenches reduce operator fatigue

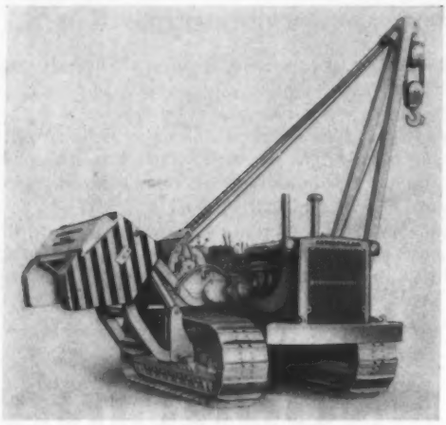
Seven new models of Sioux air impact wrenches are available from Albertson & Co., Inc.

The smallest of these wrenches weighs only 2¾ pounds and reportedly delivers 95 pounds of torque. It features a remote air exhaust system that carries air and oil six feet away from the operator. This model is operated with a paddle switch.

At the other end of the torque range is a unit that will deliver 1,200 pounds of torque with 120 pounds of air pressure at the tool.

Designed to reduce the usual pull as the wrench impacts, these units thus reduce operator fatigue, the manufacturer states.

For further information write to Albertson & Co., Inc., Dept. C&E, 3100 Lowell Ave., Sioux City, Iowa, or use the card at page 18. Circle No. 114.



Weight of the Caterpillar Series H No. 583 pipelayer is 83,840 pounds, and flywheel horsepower has been increased to 225. Counterweight design incorporates a bottom pivot, rotating the counterweights upward and out from a second pivot point on the counterweight frame.

More hp, lifting capacity featured on pipelayer

Increased lifting capacity and greater horsepower are two major benefits of the new Caterpillar Series H No. 583 pipelayer.

The machine weighs 83,840 pounds, and flywheel horsepower is 225, compared to 191 on the Series E. Lifting capacity, at 4-foot overhang, has been upped to 137,000 pounds. The unit has a top speed of 6.4 mph.

Standard track shoe width on the No. 583 is 28 inches, with an optional width of 30 inches.

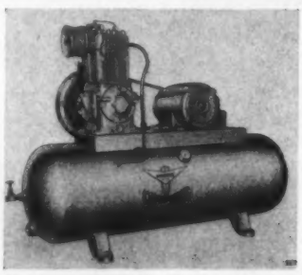
Primary pipelayer controls—clutch and brake controls for the winches—are console-mounted directly forward of the operator's right-arm position.

For further information write to the Caterpillar Tractor Co., Dept. C&E, Peoria, Ill., or use the Request Card that is bound in at page 18. Circle No. 46.

Expand compressor line to more than 200 models

A new line of air compressors is announced by the Lincoln Engineering Co.

The compressors, of the reciprocating type, are available in over 200 models, with motor or engine capacities from ¼ to 20-hp, air displacement up to 92 cfm, and tank capacities up to 200 gallons.



Both horizontal and vertical-mounted tank models are equipped for automatic start and stop operation; horizontal models also offer continuous service operation. All models are loadless-starting; the motor is allowed to attain full speed before compression starts.

For further information write to the Lincoln Engineering Co., Dept. C&E, 5701 Natural Bridge Ave., St. Louis 20, Mo., or use the Request Card at page 18. Circle No. 92.

Vibrator is convertible to concrete grinder

Wyzenbeek & Staff, Inc., announces concrete-grinding angle heads for use with the Wyco Junior vibrator. By replacing the vibrator head with this angle head, the unit is quickly changed to a highly portable grinder that may be suspended from the operator's shoulder.

The motor of the unit has a full filter system designed to keep it free of concrete dust and other foreign matter. Four angle-head speeds are offered with motors of ½, ¾, or 1 horsepower.

The unit weighs 20 pounds.

For further information write to Wyzenbeek & Staff, Inc., Dept. C&E, 223 N. California Ave., Chicago 12, Ill., or use the Request Card at page 18. Circle No. 54.

Spreader controls flow in forward, reverse

The Hi-Way Model R aggregate spreader, a positive feed unit that controls material flow in either forward or reverse, is available from the Highway Equipment Co.

Designed particularly for seal coating, the Model R is offered in six standard sizes that spread in widths from 8 to 13 feet. Fully interchangeable with different dump bodies, it handles all aggregate from sand to crushed rock.

Features include single-shift 3-position lever that controls the agitator and feed roller, and returns automatically to neutral in the event of a shifting error; adjustable feed-gate levers, mounted at both ends of the spreader, permitting tapered spreads when desired; and a swivel-type self-coupling, adjustable spreader hitch that can be raised and lowered by crank to fit any truck height.

The Model R aggregate spreader can be attached or detached in minutes and, equipped with an optional trailer, becomes transportable by either car or truck.

For further information write to the Highway Equipment Co., Dept. H20-2, Dept. C&E, 616 D Ave. N. W., Cedar Rapids, Iowa, or use the Request Card at page 18. Circle No. 90.

Device speeds sealing of waterstop sections

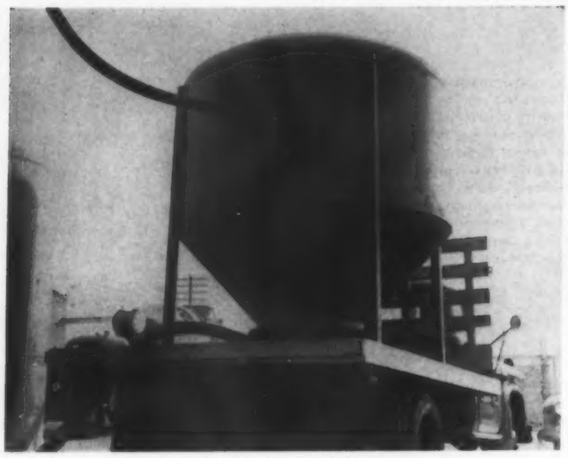
Waterseals, Inc., offers the Sealiron, a device for easier, quicker, and more efficient joining of vinyl plastic waterstop sections.

This equipment, which operates on 110 volts ac, includes a simple rheo-

stat for adjusting the iron to the temperature required for smooth sealing, regardless of job or weather conditions. Said to be equally efficient in sealing either "labyrinth" or "strip-type" waterstops, the Sealiron is light in weight and sturdily built.

For further information write to Waterseals, Inc., Dept. C&E, 6 S. Clinton, Chicago, Ill., or use the Request Card that is bound in at page 18. Circle No. 85.

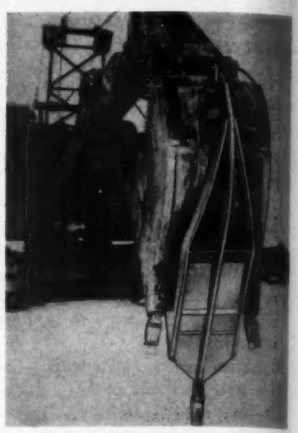
Hand tamping by a simple rolling action is made possible with the Roller-Tamper manufactured by Watson-Cmetco. The long handle can be adjusted to an offset angle to allow the worker to roll-tamp as he stands off the slab. According to the producer, the Roller-Tamper brings grout to the surface, and the roller action knocks down bumps and permits a second tamping after longitudinal floating has been done. It applies uniform pressure for even slab compaction, and minimizes creep on slope pours. For further information write to the Cmetco Division, **H. S. Watson Co.**, Dept. C&E, 1316 67th St., Emeryville 8, Calif., or use the Request Card at page 18. Circle No. 96.



With this pneumatic trailer and truck body, bulk cement may be delivered directly into the silo, without using a track hopper and bucket elevator, in distances up to 100 feet vertically and 150 feet horizontally. The unit can be operated with ordinary compressed air. Delivery rate is 800 to 1,000 pounds per minute, depending on distance. The trailer may also be used for conventional bottom dumping into regular track hoppers. For further information write to the **Albert Air Conveyor Corp.,** Dept. C&E, 50 Drumm St., San Francisco 11, Calif., or use the Request Card at page 18. Circle No. 72.

Hoe bucket attachment rips frozen ground

A hoe bucket attachment designed to rip hard and frozen ground while digging at half throttle, with no danger of breaking or damaging the



hoe boom or bucket, is announced by the Rapid Ripper Mfg. Co.

According to the manufacturer, initial installation requires welding two pin-supporting ears to the back of the bucket; once the ears are installed, the Rapid Ripper takes less than two minutes to attach, one minute to remove. The unit does not interfere with normal digging operations after tough ground has been pierced.

For further information write to the Rapid Ripper Mfg. Co., Dept. C&E, 4 Half Mile Road, Racine, Wis., or use the Request Card at page 18. Circle No. 23.

Improved soil scraper offered in two models

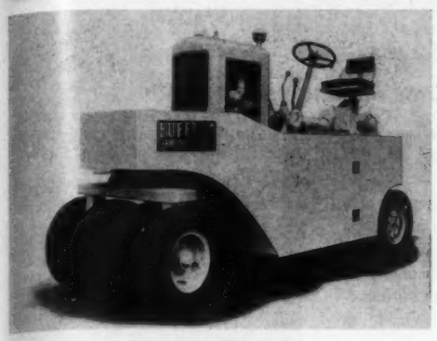
A new, improved soil scraper is available from the Servis Equipment Co.

According to the manufacturer, the unit features a new and easier latching system for scarifier teeth; a

slightly wider cut on the 66-inch model; a different curve in the moldboard section to insure a full load of dirt; and a full-length bumper bar on the rear blade to prevent bending under rough service.

A 72-inch-wide model is also available.

For further information write to the Servis Equipment Co., Dept. C&E, 1000 Singleton Blvd., Dallas, Texas, or use the Request Card at page 18. Circle No. 24.



On the Model PSR-9, the four drive wheels have double-shoe-type, self-energizing brakes that are hydraulically actuated by means of a foot pedal.

An all-aluminum highway guardrail system, designed for rapid installation and freedom from maintenance, is announced by the Aluminum Co. of America. Formed from high-strength Alclad alloy, the guardrail features a coating of high-purity aluminum for protection from corrosion; it will never require painting. Available in three thicknesses, the panels measure 12¼ inches wide and 3¼ inches deep. Standard panels are 13½ feet long. For further information write to the **Aluminum Co. of America,** Dept. C&E, 1501 Alcoa Bldg., Pittsburgh, Pa., or use the Request Card at page 18. Circle No. 47.

Pneumatic-tire roller in 3 to 10-ton class

Buffalo-Springfield announces a new 3 to 10-ton, 9-wheel, self-propelled pneumatic-tire roller.

Designated Model PSR-9, it features a sliding gear-type transmission with torque converter that provides three speed ratios up to 15 mph, forward and reverse. Drive wheels are mounted on oscillating frames, with two driving and one roller wheel on one side, and two driving wheels on the other side.

The roller has a 6-cylinder heavy-duty gasoline engine that delivers a maximum of 73 horsepower.

Complete operating controls are grouped on the left side of the machine.

Minimum weight of the PSR-9 is approximately 6,500 pounds, for a weight of 720 pounds per wheel. Maximum ballasted weight is approximately 20,500 pounds, giving a weight of 2,270 pounds per wheel.

Standard-size tires are 7.50×15, 6-ply, smooth tread. Ten-ply tires are available as optional equipment. The rolling width of the machine is 68 inches; tire overlap, 1 inch.

For further information write to the Buffalo-Springfield Roller Co., Dept. C&E, 1210 Kenton St., Springfield, Ohio, or use the Request Card at page 18. Circle No. 7.

Longer life claimed for new-type road form

The Highway Products Division of Fabricated Steel Service, Inc., announces a new type of road form for concrete highways and airport runways.

This form incorporates a box-section rail construction and a vertical angle stiffener said to assure longer form life. The increased rigidity, due to the square tubular rail construction and angle columnar reinforcement, makes certain that concrete slabs meet both state and federal specifications, according to the manufacturer.

For further information write to Fabricated Steel Service, Inc., Highway Products Division, Dept. C&E, 7400 Laurel Canyon Blvd., North Hollywood, Calif., or use the Request Card at page 18. Circle No. 27.

The new Galion unit is easily transported. After the towing hitch is attached to the truck, the towing wheels are lowered hydraulically, thus raising the roller off the ground.

Tandem roller features retractable wheels

Galion's new 4 to 6-ton retractable-wheel tandem roller is supplied with Roll-O-Matic drive.

According to the company, this drive is a combination of torque converter, automatic fluid transmission, and tail-shaft governor, by means of which the rolling power is automatically increased or decreased as needed.

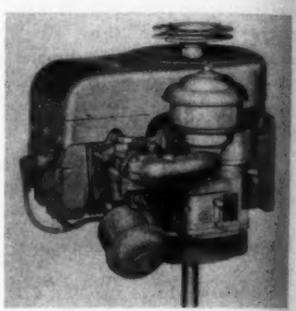
The manufacturer also claims that: more than twice the needed power is available; fuel consumption is reduced up to 25 per cent; engine life is increased up to 35 per cent; the life of forward-reverse clutches is increased 40 to 50 per cent; and 10 per cent more surface can be rolled per day.

Rolling speeds from 0.5 to 5.6 mph are provided by a 2-range transmission.

For further information write to The Galion Iron Works & Mfg. Co., Dept. C&E, Galion, Ohio, or use the Request Card at page 18. Circle No. 8.

Vertical-shaft engine available in two models

The Wisconsin Motor Corp. announces two new vertical-shaft engines: the Model HACN, with a power range from 2.5 to 6 horsepower, at 1,600 to 3,600 rpm; and



the Model HBKN, with a range from 3.5 to 7 horsepower, in a 1,600 to 3,600-rpm speed range.

Features include tapered roller main bearings; forged-aluminum connecting rod; counterbalanced, heat-treated drop-forged crankshaft; removable aluminum cylinder head; replaceable valve stem guides; and many others.

Positive lubrication is supplied by a vane-type oil pump, which furnishes spray in the crankcase to lubricate all internal engine parts. The oil pump is driven off the crankshaft and is located in the engine base.

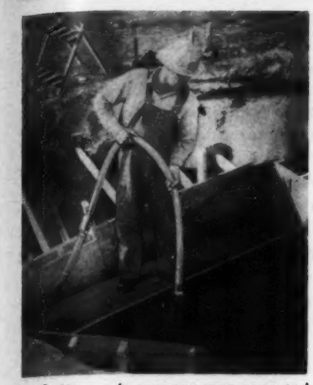
For further information write to the Wisconsin Motor Corp., Dept. C&E, 1910 S. 53rd St., Milwaukee 46, Wis., or use the Request Card at page 18. Circle No. 62.

Concrete vibrator offers new design principle

A one-man-operated concrete vibrator designed to utilize low-amplitude, high-frequency vibration is announced by the Construction Equipment Division of Pacific Mercury.

According to the manufacturer, there are no bearings in this device. The motor is located in the head of the vibrator, thereby eliminating the labor of one man in the vibration operation.

The PM concrete vibrator is available in two basic motor sizes, with



Pacific Mercury's new one-man-operated concrete vibrator reportedly will vibrate to depths of 44 feet.

either a 1½ or 2½-inch-diameter head. The casing is available in 7, 14, or 21 feet. The small model is especially recommended for prestressed and post-tensioned sections and for concrete precasting; the large model is suitable for everything from 6-inch sections to mass concrete.

For further information write to Pacific Mercury, Construction Equipment Division, Dept. C&E, 14052 Burbank Blvd., Van Nuys, Calif., or use the card at page 18. Circle No. 9.

New trencher features telescoping digging boom

The Charles Machine Works, Inc., announces the Model M-3 Ditch Witch trencher.

Included among the machine's many features are a 3-piece telescoping digging boom; a new boom-positioning screw said to raise and lower the boom three times as fast with half the effort; and a planetary gear reduction unit with a single-lever shift device that changes reduction range from travel speed to digging speed effortlessly.

Also available is a complete selection of digging teeth for trench widths of 3, 4, 6, or 8 inches.

A Wisconsin Model AENL 9.2-hp engine supplies the power.

For further information write to The Charles Machine Works, Inc., Dept. C&E, 684 B St., Perry, Okla., or use the Request Card at page 18. Circle No. 97.

Concrete-form coating impervious to moisture

Poly-Kote FG-54, a new chemically compounded coating for concrete forms, is announced by Brad Chemical, Inc.

This viscous concentrate is a water-thin solution said not to be affected by extremes of either hot or cold weather. Added to any grade of fuel oil, it can be applied by either spray or brush, or can be mopped on. The barrier that Poly-Kote FG-54 sets up between the form face and the concrete is impervious to any type of moisture, the manufacturer reports.

For further information write to Brad Chemical, Inc., Dept. C&E, 111 W. Washington St., Chicago 2, Ill., or use the Request Card at page 18. Circle No. 29.

For more facts, use coupon or circle No. 288→

Time-study tests taken on construction jobs reportedly show that a worker using a coil of wire in a belt-worn dispenser can make up to 25 per cent more ties per hour, according to the Northwestern Steel & Wire Co., manufacturers of Sterling Re-Bar tie wire. Sterling wire is packed 20 coils to the carton, and each coil weighs four pounds. For further information write to the **Northwestern Steel & Wire Co.**, Dept. C&E, Sterling, Ill., or use the Request Card at page 18. Circle No. 45.

Announce new air motors for heavy-duty service

The new line of Joy Pistonair heavy-duty 5-cylinder radial air motors is said to combine extremely high starting torque and sustained load-lugging ability with a simple throttle valve control that allows instant starts and stops, unlimited reversibility, and infinitely variable speeds. Repeated overloads or stalls cannot harm these motors, states the manufacturer, and they operate safely and dependably in explosive, damp, hot, or corrosive atmospheres.

Horsepower ratings range from 11½ to 20 at 90 psi. Direct-drive models turn at 400 to 800 rpm at rated horsepower with stall torques from 225 to 162 foot-pounds. Weights range from 230 to 289 pounds.

For further information write to the Joy Mfg. Co., Dept. C&E, 333 Henry W. Oliver Bldg., Pittsburgh 22, Pa., or use the Request Card at page 18. Circle No. 81.

Trencher now equipped with V-shaped conveyor

The Cleveland Model 240 trencher is now equipped with a 12×2½-foot power-shifted, power-folded V-shaped conveyor.

This unit is said to provide a constant elevating angle for faster, higher spoil discharge, and reduces rolling and tumbling of spoil. It also provides maximum clearance under the digging-wheel rims, accommodating higher heaped loads without clogging.

Controls for the hydraulic shifting, positioning, and folding of the unit are located at the operator's seat.

Power folding brings the conveyor down to within the Model 240's 8-foot over-all width, allowing over-the-road transport without special highway permits.

For further information write to the Cleveland Trencher Co., Dept. C&E, 20100 St. Clair Ave., Cleveland 17, Ohio, or use the Request Card at page 18. Circle No. 15.

The International Pippin No. 260 backhoe reportedly can dig forward to within 6 inches of the tractor axle, yet provides a 14¾-foot reach at ground level. It has a digging radius of 180 degrees and a maximum digging depth of 12½ feet.

Backhoe for tight work digs to 12½-foot depth

The International Pippin No. 260 backhoe, designed to work in tight quarters and close to the tractor, is announced by the International Harvester Co.

With a digging radius of 180 degrees, the No. 260 has a 12½-foot digging depth and a 14¾-foot reach at ground level. Its bucket opens up to dig forward within 6 inches of the tractor axle, and it can reach back under sidewalks, drives, or other obstructions. The backhoe also will dig a 10-foot-deep vertical wall just 8 feet back of the tractor.

The new unit can be used singly with International 240, 340, and 460 utility tractors equipped with a front counterweight box, or can be mounted on these machines in combination with a front-end hydraulic loader or dozer blade.

Numerous buckets and attachments are available for a wide range of digging, trenching, and special work.

For further information write to the International Harvester Co., Dept. C&E, 180 N. Michigan Ave., Chicago, Ill., or use the Request Card at page 18. Circle No. 36.

To obtain further information on any of the products described in this section, circle the number given at the end of the item on the Request Card at page 18.

Portable batching plant features 6-yard capacity

Aeroil Products Co., Inc., announces a 6-yard portable batching plant capable of producing up to 40 yards per hour.

The plant features the use of Man-Ten abrasion-resistant steel in the hopper.

Beam scales with over/under indicator are furnished as standard equipment. Dial scales are available as optional equipment. The conveyor is 24 inches wide and has a normal discharge height of 12 feet. The belt is mounted on 4-inch triple troughing idlers, with extra idlers provided at the loading point and a belt wiper on the head pulley.

The plant is 4-wheel-mounted for portability and is available in either gasoline-engine or electric-motor drive.

The total weight is approximately 6,500 pounds; over-all width is 7 feet, and over-all length 36 feet 6 inches.

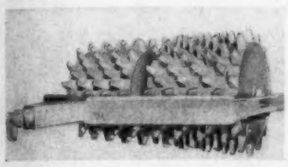
For further information write to Aeroil Products Co., Inc., Dept. C&E, 17 Wesley St., South Hackensack, N. J., or use the Request Card at page 18. Circle No. 56.

Aeroil's new 6-yard plant is 4-wheel-mounted for portability and is available in either gasoline-engine or electric-motor drive.

New tamping roller is heavy-duty compactor

For heavy-duty compacting, American Steel Works offers the Dreadnaught Wedgefoot Model ADB 120 "full-wedge" foot roller.

Over-all length of the unit is about



16 feet; over-all width, about 12 feet. It has two drums, each measuring 5 feet in length and 5 feet at the outside diameter. Total empty weight is 16,500 pounds.

Replaceable cleaner tooth tips are a feature.

For further information write to the American Steel Works, Dept. C&E, 1211 W. 27th St., Kansas City 8, Mo., or use the Request Card at page 18. Circle No. 83.

New tar-rubber emulsion protects paved surfaces

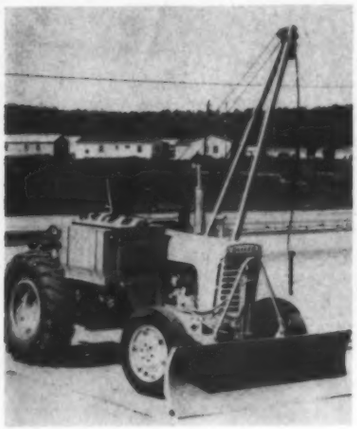
Cosmilastic, a new tar-rubber emulsion designed to give added protection to both concrete and asphalt surfaces, is offered by the D. C. Harris Co.

This emulsion reportedly features a high degree of expansion and contraction, and adheres to the paving surface for long periods of time.

Applied on asphalt pavements, it seals in the asphaltic oils and seals out external destructive factors such as petroleum products, oxidation, sunlight, and acids. Applied to concrete surfaces, it protects against water penetration, as well as against salts and acids. It is also effective on foundations, both above and below grade, the company reports.

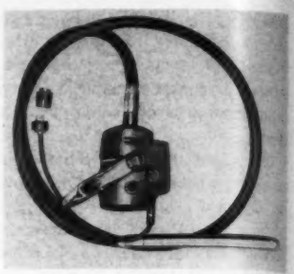
Cosmilastic can be applied by brush or squeegee on both new and old surfaces, with no heat or extended mixing needed during application.

For further information write to the D. C. Harris Co., Dept. C&E, Wooster, Ohio, or use the Request Card that is bound in at page 18. Circle No. 64.



A new side boom for use on rubber-tire tractors is available from the Midwestern Mfg. Co. The boom has a lifting capacity of 7,000 pounds, with all-hydraulic operation, and a friction clutch for free spooling of the load line. A counterweight can be extended to increase stability on rough terrain or with heavy loads. For further information write to the **Midwestern Mfg. Co.**, Dept. C&E, P. O. Box 1886, Tulsa, Okla., or use the Request Card at page 18. Circle No. 35.

Flexible-shaft vibrators designed for tight work



Two new flexible-shaft electric concrete vibrators, the Model ELV-5 with 5 feet of flexible shaft and the Model ELV-10 with 10 feet, are available from the Construction Equipment Division of the Thor Power Tool Co.

The vibrators are available in head sizes of 1, 1¼, 1½, and 1¾ inches.

Both units are powered by a 1-hp universal electric motor and produce an impact of 10,000 to 12,000 vibra-

New diamond core drill is lightweight, versatile

Bucyrus-Erie offers the Winkie, a portable, lightweight diamond core drill for exploration and test-hole work.

One man can operate this drill, which weighs only 45 pounds and measures 19 inches high and 12 inches wide. It is powered by a 2-cycle air-cooled gasoline engine producing 5½ horsepower at 5,000 rpm. The maximum bit speed is 2,000 rpm.

In shallow drilling the Winkie reportedly can recover cores up to 8 inches in diameter; 15/16-inch cores can be recovered down to 200 feet.

Standard core barrel lengths run to 18 inches; longer lengths are available to specifications.

Other applications for the Winkie include: grout-hole and blast-hole drilling, and drilling conduit and other structural holes in masonry at any angle.

For further information write to the Bucyrus-Erie Co., Drill Division, Dept. C&E, Richmond, Ind., or use the Request Card at page 18. Circle No. 108.

The Winkie drill weighs only 45 pounds. In shallow drilling, according to the manufacturer, it can recover cores up to 8 inches in diameter, while 15/16-inch cores can be recovered down to 200 feet.

How to estimate ground-water discharg

of Beth-Cu-Loy subsurface drainage pipe

Use simple formula, or nomograph on opposite page

You can easily minimize ground water dangers by the proper use of subsurface drainage structures made from galvanized corrugated Beth-Cu-Loy sheets. Pipe for this purpose is perforated to permit excess ground water to trickle in and run off to a predetermined point of deposit. But—since the size of your subsurface pipe depends on the amount of ground water to be handled—how do you estimate the potential runoff?

In plotting ground-water discharge under a variety of subsurface conditions, many engineers have been using the simple formula shown at the right.

$$Q = \frac{C \times L \times W}{43{,}560}$$

where

Q = quantity of water in cu ft per sec for perforated pipe

L = length of perforated pipe in feet

W = width of area to be subdrained*

C = a constant representing depth of gr water (in.) to be subdrained in 24 (refer to table on opposite page for v of "C" to obtain cu ft per sec per Your soils man can help in analyzing permeability and estimating the dep water to be removed).

*One pipe only, not a network of drain.

tions per minute through a heavy-duty eccentric vibrator head supported by duplex bearings.

Built for easy portability, the Thor ELV-5 weighs 18 15/16 pounds, and the ELV-10 weighs 23 11/16 pounds. The drive of each can be extended to 20 feet by attaching extensions with a ball-bearing connector.

For further information write to the Thor Power Tool Co., Dept. C&E, 175 N. State St., Aurora, Ill., or use the Request Card that is bound in at page 18. Circle No. 110.

Two new power units develop 45, 67 bhp

The Allis-Chalmers Mfg. Co. announces two new 4-cylinder engines, the Models G-149 and G-226.

The 149-cubic-inch G-149 gasoline power unit develops 45 brake horsepower at 2,000 rpm; the 226-cubic-inch G-226 develops 67 brake horsepower at 1,800 rpm. Both are water-cooled valve-in-head engines with replaceable wet-type cylinder sleeves.

According to the company, economy of operation is obtained through the use of maximum high-compression ratios, which for the G-149 is 7.5:1, and for the G-226 is 7.25:1.

The new engines are available for use with natural or LP gas, kerosene, No. 1 distillate, or tractor fuel.

For further information write to the Allis-Chalmers Mfg. Co., Dept. C&E, P. O. Box 512, Milwaukee, Wis., or use the Request Card that is bound in at page 18 of this issue. Circle No. 16.

Increased payload, additional "cube" capacity, and much greater front-end stability are features claimed for the new Truco dual front-wheel assembly.

Front-wheel assembly has dual-wheel design

The Truco dual front-wheel assembly designed to permit front axles to carry 18,000 pounds or more, and said to substantially increase tire mileage, is offered by the Truck Equipment Co.

Front tires and wheels are interchangeable with rear tires and wheels, and parts are interchangeable with standard units in service.

The four tires are individually mounted on standard wheel bearings to allow each wheel to roll free of the other. This assembly, according to the manufacturer, minimizes the flotation problem common to many off-road operations.

The Truco axle assembly is adaptable to all types of truck operation and truck design.

For further information write to the Truck Equipment Co., Dept. C&E, 3963 Walnut St., Denver 5, Colo., or use the Request Card at page 18. Circle No. 73.

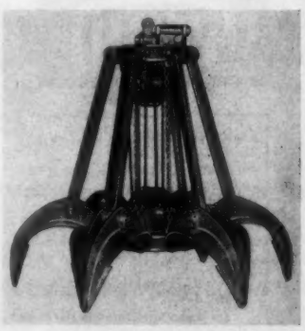
Riprap bucket offered in sizes up to 2 yards

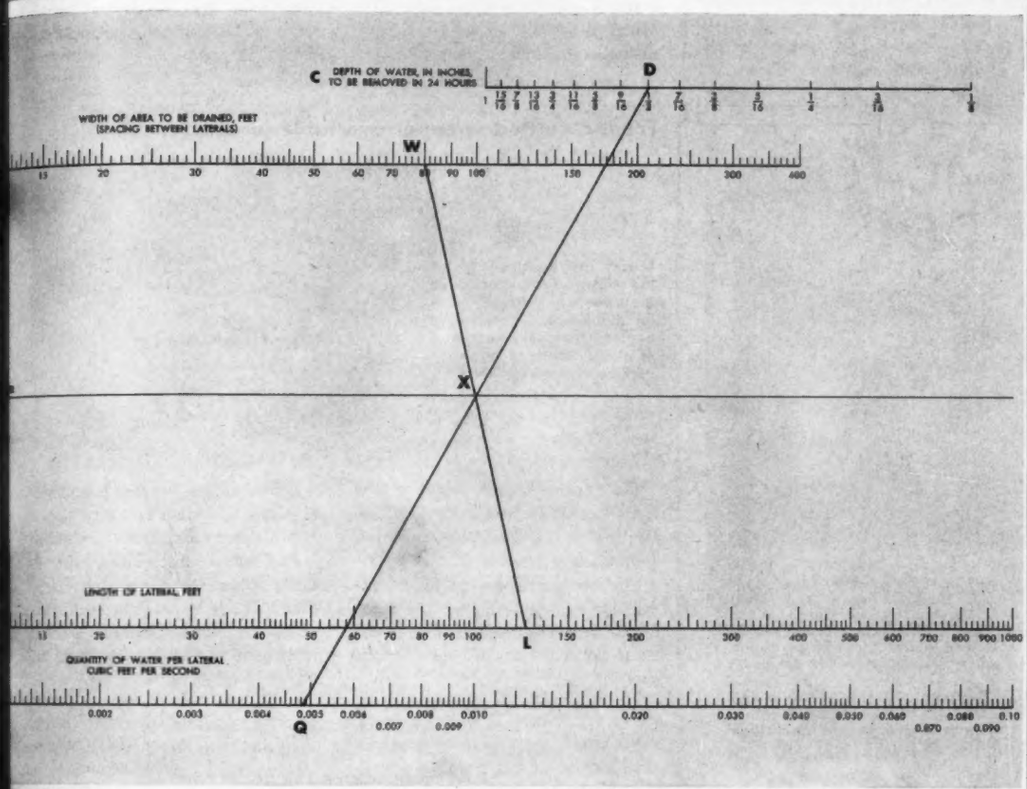
The Yaun Mfg. Co., Inc., offers a new orange peel riprap bucket, in sizes from ½ to 2 cubic yards.

The bucket is designed to pick up piles of stone easily and is adapted especially to unload gondola cars.

The ½-yard bucket weighs approximately 2,000 pounds; the 2-yard bucket, approximately 12,000 pounds.

For further information write to the Yaun Mfg. Co., Inc., Dept. C&E, P. O. Box 1508, Baton Rouge, La., or use the Request Card at page 18. Circle No. 6.





How To Use This Nomograph

LE—CONSTANT C *(Subsurface Runoff in 24 Hours)*

Soil Permeability Type	Depth in.		Quantity of Water Per Lateral (cubic feet per second per acre)
	Fraction	Decimal	Constant C
to Moderate	1/16	0.0625	0.0026
"	1/8	0.1250	0.0052
"	3/16	0.1875	0.0079
"	1/4	0.2500	0.0105
Moderate	5/16	0.3125	0.0131
"	3/8	0.3750	0.0157
"	7/16	0.4375	0.0184
"	1/2	0.5000	0.0210
"	9/16	0.5625	0.0236
to Fast	5/8	0.6250	0.0262
"	11/16	0.6875	0.0289
"	3/4	0.7500	0.0315
"	13/16	0.8125	0.0341
"	7/8	0.8750	0.0367
"	15/16	0.9375	0.0394
"	1	1.0000	0.0420

If you prefer to avoid arithmetical calculations, you'll find the nomograph a time-saver. Let's follow an example to see how the graph works out. Assuming an area-width (W) of 80 ft, and the length of the pipe lateral (L) to be 125 ft, draw a straight line (WL) between these points through the transfer axis line, thus establishing point X.

Let us further assume that your local soils technician has estimated that ½ in. of water is the depth to be drained in any 24-hr period. Draw another straight line from the "½" figure at point D, down through X, and extend it to the quantity line at Q. The reading at point Q shows that 0.0048 cu ft per sec of water can be expected through the lateral pipe.

Your Fabricator Can Help at This Point

With this information, your pipe fabricator can help you determine the size of pipe needed to handle the flow.

Pipe made from Beth-Cu-Loy galvanized corrugated steel sheets is ideal for subdrainage applications. It's strong, light in weight, long-lasting, and economical. Flexible, too. In all respects, it meets the rigid specs of the American Association of State Highway Officials.

Bethlehem makes only the Beth-Cu-Loy (copper bearing steel) sheets, not the pipe itself. Consult your fabricator for details on this versatile material.

On the Model 2900, adjustable self-aligning hook rollers offer precise 12-point adjustment to keep the rollers matched with the roller path. The new truck crane is said to be easily converted to clamshell or dragline.

Expand equipment line with 60-ton truck crane

The Manitowoc Engineering Corp. announces a 60-ton-capacity truck crane called Model 2900.

According to the manufacturer, stability is increased by the unit's widespread outriggers, plus the combination of the removable bumper counterweight and a solid front axle.

The carrier features include 2-axle drive; heavy-duty air brakes on all wheels; full-time power steering; highway speeds up to 35 mph; full-vision cab; and choice of several makes of gasoline or diesel engines.

The main machinery features only 14 gears, precise disk-type swing clutches, and plunger drum control on main clutches. The double-drum worm-drive independent boom hoist provides more speed in raising and lowering, and equalizes pull on the boom to minimize cable wear.

For further information write to the Manitowoc Engineering Corp., Dept. C&E, 16th and River Sts., Manitowoc, Wis., or use the Request Card that is bound in at page 18. Circle No. 17.

Front-mounted sweeper available for tractor

Specifically designed for the Napco Crab tractor, the sweeper is driven by an independent gasoline engine, thus eliminating need for attaching or removing a power takeoff.

The Little Giant Model FM-C front-mounted sweeper is available for the Napco Crab 4-wheel-drive, 4-wheel-steer tractor.

The sweeper is driven by an independent gasoline engine. The speed of the broom is constant and is entirely independent of the tractor's speed.

Removing the sweeper assembly is a simple operation requiring only a few minutes, the manufacturer states.

For further information write to Little Giant Products, Inc., Dept. C&E, 1530 N. Adams St., Peoria, Ill., or use the Request Card that is bound in at page 18 of this issue. Circle No. 22.

For more data on any item, circle indicated number on card at page 18.

To transport personnel up and down 140-foot intake shafts, Morrison-Knudsen - Kiewit - Johnson used a new type of demountable elevator made by the Hawkeye Products Corp., Syracuse, N. Y. Seven of these shafts with connecting upstream tunnels make up a $13 million portion of the Oahe Reservoir Power Project located on the Missouri River in South Dakota. Because the project specifications called for elevators or stairways to be installed after the shafts reached the 30-foot level, it was impossible to install permanent-type elevators. The Hawkeye elevator travels on a vertical monorail made up of ordinary H-beam sections joined to form a rigid column of any desired height. The car has a 4 × 6-foot platform, and has a carrying capacity of 2,000 pounds. For further information write to the **Hawkeye Products Corp.**, Dept. C&E, 1013 S. State St., Syracuse 3, N. Y., or use the Request Card at page 18. Circle No. 39.

Announce new method of testing bond strength

A new method of measuring the bond strength of almost any material is announced by W. C. Dillon & Co., Inc.

According to the manufacturer, by combining a Dillon dynamometer with a screw jack and materials found in almost any metal-working shop, a highly efficient tensile tester can easily be fabricated.

The testing assembly consists of two parts: (1) a hook with a plug that is anchored within or on the underside of the material to be tested, and (2) the dynamometer integrated with a screw jack. The latter assembly is placed over the anchored hook so that the hook and the dynamometer clevis are joined. The jack is turned slowly until the material being tested gives way. The dynamometer, at that moment, gives the actual bond or tensile strength in pounds.

The firm's dynamometers are available in 13 capacities from 500 to 100,000 pounds, with either 5 or 10-inch dials.

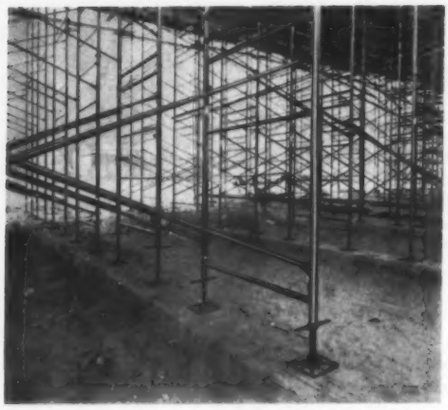
For further information write to W. C. Dillon & Co., Inc., Dept. C&E, 14620 Keswick St., Van Nuys, Calif., or use the Request Card that is bound in at page 18 of this issue. Circle No. 111.

New whiteprint machine features compact design

A compact whiteprint machine, which has a full 18-inch printing width and is capable of making as many as 450 letter-size copies per hour, is announced by the Reproduction Products Co.

Designed for use in small offices and drafting rooms, the Reprofax Viking operates on standard 115 volts ac, 60 cycles. A constant-wattage transformer stabilizes light output from the 800-watt printing lamp despite voltage fluctuations. The unit measures 30 inches wide, 18½ inches deep, and 11½ inches high. Weight is 119 pounds.

For further information write to the Reproduction Products Co., Dept. C&E, 12790 Westwood Ave., Detroit 23, Mich., or use the Request Card that is bound in at page 18. Circle No. 4.



Working loads up to 20,000 pounds per shoring panel are featured by the new line of Waco Hi-Load heavy-duty shoring equipment. In addition to the panels, Hi-Load equipment includes a complete line of shore heads, adjustment screws, and accessory items, all designed to carry loads equal to the panel loads. The photo shows panels used by the Guy F. Atkinson Co., of South San Francisco; in some instances this job called for shoring heights of 35 feet and clear spans of 29 feet. For further information write to the **Waco Mfg. Co.**, Dept. C&E, 5251 W. 130th St., Cleveland, Ohio, or use the Request Card at page 18. Circle No. 86.

Semiautomatic welder is versatile unit

A portable semiautomatic welder designed for either open-arc hard-surfacing or submerged-arc welding is announced by Hobart Bros. Co.

Known as Handomatic, the unit features a universal semiautomatic wire feeder, and may be readily connected to almost any welding machine, either ac or dc. To weld, it is necessary only to connect the welding cables and one ground wire from the unit.

A single rheostat controls the wire-feed speed. Feed rolls, pressure rolls, and current tips are available for 5/64 and 3/32-inch solid hard wire; and

New photocopying process uses present equipment

A new photocopying process, called Photorapid Magi-Plate, is announced by the Pacific Copy Corp.

These aluminum Magi-Plates use present photocopy equipment by adding a simple attachment. The plates are said to provide direct photocopy image transfers of anything the eye can see, including a true solid photographic line, as well as optimum reproduction from halftones, solid images, and colors, without the use of filters, powders, or chemicals.

This system uses a sensitized paper, one not affected by ordinary room light, as a photocopy negative of material that is to be duplicated by offset. This negative is placed against the Magi-Plate, and both are run through the photocopy attachment. The paper negative reportedly can be peeled from the plate immediately, and it is ready for the press in less than 60 seconds from start to finish of the operation.

For further information write to the Pacific Copy Corp., Dept. C&E, 142 Oregon St., El Segundo, Calif., or use the Request Card at page 18. Circle No. 103.

New curb form clamp eliminates spreaders

An adjustable curb form clamp with positive locking action, which eliminates the need for spreaders, wood jacks, stake wires, and face form stakes, is offered by S & W Curb Clamp, Inc.

The clamp is adjustable for a 6, 7, or 8-inch curb face, and to various gutter widths. It is designed to space forms to a true curb section and to hold them rigid during the pour.

According to the manufacturer, these clamps are available for either wood or metal forms; for any combination of wood or metal forms; and for ¾-inch wood bender boards.

For further information write to S & W Curb Clamp, Inc., Dept. C&E, P. O. Box 66, El Cajon, Calif., or use the Request Card at page 18. Circle No. 112.

For more data on any item, circle indicated number on card at page 18.

3/32 and 7/64-inch tubular (fabricated) wire. The unit is designed for use with continuous current up to 500 amp using the flux-type or open-arc gun. Over-all dimensions are 27¾ inches high, 34 inches long, and 9¾ inches wide.

For further information write to the Hobart Bros. Co., Dept. C&E, Hobart Square, Troy, Ohio, or use the Request Card at page 18. Circle No. 100.

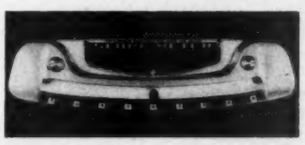
To obtain further information on any of the products described in this section, circle the number given at the end of the item on the Request Card at page 18.

Workman tightens nut on contact sheeting assembly, which is attached to soldier beam in ground (behind 3 × 10-inch sheeting) on B. Perini & Sons' 50-foot-deep cut for a Boston subway contract. A new development, this sheeting system is recommended for any deep, tight excavation where water can be drained from the soil. A number of slotted steel clips are slipped onto the flange of each vertical soldier beam, previously driven into the ground. Random lengths of 3 × 10-inch sheeting, spanning two or more bays, are then placed against the face of the soldier beams and made fast with an 18-inch-long, high-strength steel bar held by a ¾-inch-diameter bolt. For further information write to **Contact Sheeting, Inc.**, division of Coakley & Booth, Inc., Dept. C&E, The Biltmore, 55 E. 43rd St., New York 17, N. Y., or use the Request Card at page 18. Circle No. 89.

Slope measuring device for very fine work

The Slope Meter No. 2, similar to the standard Slope Meter but with the tube bent on a much flatter arc to make it suitable for very fine work, is available from The Slope Meter Co.

Like its predecessor model, the new unit eliminates the necessity of stopping a machine in order to take accurate readings. Where the former device is recommended for use on any machine that normally handles backslopes and shoulder slopes of more than 8 degrees, the No. 2 instrument is especially suited to machines working constantly on crowns or preparing the grade ahead of pavers.



For further information write to The Slope Meter Co., Dept. C&E, P. O. Box 268-C, Excelsior, Minn., or use the Request Card at page 18. Circle No. 82.

Offer new self-propelled extruded curb machine

The new Miller Model MC-500 extruded curb machine features fast, easy interchange of the compaction chamber from right to left for laying curb from either side at a reported rate of 2,500 to 3,000 feet per day.

Wheels adjust to right or left, up, down, forward, or trailing position, and curb can be laid even in a complete circle.

The MC-500 is said to have 12 per cent more compaction with its new 8.5-hp motor, yet it is a lightweight 2-man machine. Curb forms are available in a wide range of specification shapes for both asphalt and concrete extrusion. Forms can be changed in seconds; curb can be laid flush to buildings.

For further information write to the Miller Spreader Corp., Dept. C&E, 4020 Simon Road, Youngstown 12, Ohio, or use the Request Card that is bound in at page 18 of this issue. **Circle No. 84.**

With a rated striking energy of 4,000 foot-pounds, the new Vulcan Model DGH-900 pile hammer is shown here being used by Chicago's Water Distribution Division for driving MP-116 steel sheet piles two at a time. The unit's compact design is said to make it ideal for work in close quarters. Operating on steam or compressed air, the hammer is fully automatic and drives a wide variety of piles. The short stroke permits high frequency of blows with a relatively heavy ram. The hammer has only four moving parts, and it may be disassembled in one hour or less. It is readily adaptable to three sizes of standard leads, and it may also be operated without the use of leads. For further information write to the **Vulcan Iron Works, Inc.**, Dept. C&E, 327 N. Bell Ave., Chicago 12, Ill., or use the Request Card at page 18. Circle No. 104.

New roller attachment for motor graders

The GraderrolleR, a new road-surfacing roller attachment for Caterpillar No. 12 and 112 motor graders, is announced by the Martin Co. The unit is raised and lowered by hydraulic power, and, by using the weight of the motor grader, it

Designed for use with Caterpillar No. 12 and 112 motor graders, the Martin GraderrolleR is raised and lowered by hydraulic power.

reportedly can exert up to 225 pounds compaction pressure per linear inch over its 42-inch roll width.

To match the roller angle of operation to the slope of the road, the roll is pivoted at the center and follows the road surface, regardless of the position of the motor grader. All operating adjustments can be made from the operator's platform.

The GraderrolleR is equipped with spring-tensioned scraper blades and a 35-gallon automatic sprinkling system.

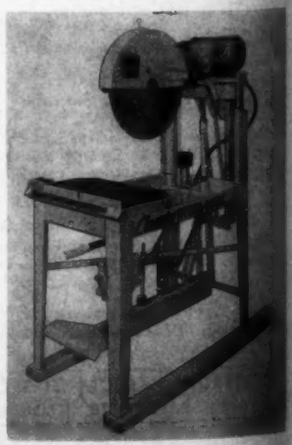
The entire unit weighs approximately 2,000 pounds.

For further information write to the Martin Co., Dept. C&E, 620 Andrews Ave., Kewanee, Ill., or use the Request Card at page 18. Circle No. 57.

Masonry saw features hydraulic operation

A masonry saw featuring a cutting head that is raised and lowered by a hydraulic process is available from the Champion Mfg. Co.

Designated Hydra-Matic, it permits saw operators—in seconds, and with no effort—to raise and lower



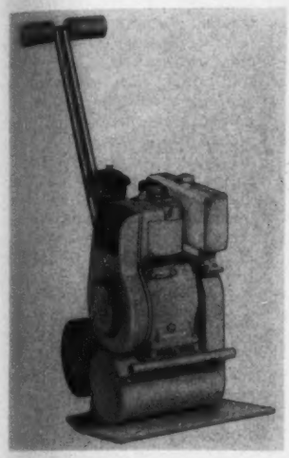
the cutting head to the precise height desired. As the cutting head goes up and down, both the cutting head and foot pedal remain level.

Available with a 14 or 20-inch blade guard, the saw comes equipped with a 110/220 voltage selector switch, an easy-to-operate diamond lock for jam cutting, either a 1½ or 2-hp air-cooled motor, and built-in protection against blade shattering.

For further information write to the Champion Mfg. Co., Dept. C&E, 2028 Washington Ave., St. Louis 8, Mo., or use the Request Card at page 18. Circle No. 93.

One-man-operated tamper is compact and powerful

The Model J-18 one-man-operated tamping machine with new shoe design and weight ratio, plus improved telescoping shock-mounted handle, is announced by The Jay Co.



The Model J-18 one-man-operated tamping machine made by the Jay Co.

The unit is powered by a Wisconsin BKN 4.6-hp air-cooled engine. Travel speeds range from 30 to 60 fpm depending on thickness of lift and type of material to be compacted.

For further information write to The Jay Co., Dept. C&E, 2222 S. Third St., Columbus 7, Ohio, or use the Request Card that is bound in at page 18. Circle No. 38.

Heavy-duty line marker travels from 3 to 6 mph

A self-propelled line marker with automotive-type steering, that is capable of climbing a 20 per cent grade under full load, is available from Unimasco, Inc.

Designated Model 9000, the unit is offered in capacities varying from 10 to 120 gallons. It can spray at from 3 to 6 mph, operating from one to three air-actuated spray guns simultaneously.

For further information write to Unimasco, Inc., Dept. C&E, 424 W. Redondo Beach Blvd., Gardena, Calif., or use the Request Card at page 18. Circle No. 119.

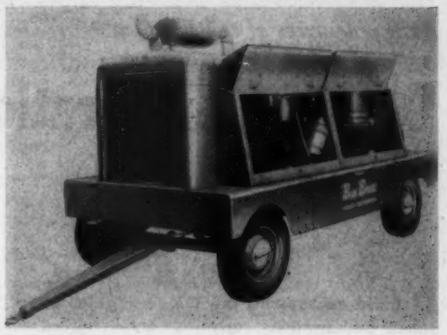
For more facts on these products, circle the indicated number on the Request Card at page 18.

New design announced for 600-cfm compressor

An addition to the current 600-cfm portable rotary compressor class is announced by the Worthington Corp.

Equipped with the Cummins Model NH-220-B1 engine, the new unit features an "over-under" design that puts the first-stage compressor cylinder directly over the second stage. It has self-draining cylinders, a silent chain drive, and two filters.

For further information write to the Worthington Corp., Dept. C&E, Worthington and Harrison Aves., Harrison, N. J., or use the Request Card at page 18. Circle No. 117.



Powered by a Cummins engine, the new Worthington compressor offers an "over-under" design that puts the first-stage compressor cylinder directly over the second stage.

Basic procedures of soil sampling

Detailed explorations

by WILLIAM L. ACKER, president,
Acker Drill Co., Scranton, Pa.

Figure 3. Acker Teredo drill rig driving casing with a drive weight.

Detailed explorations fall into two broad classifications: drive or dry sampling and undisturbed sampling. The first is made with a thick-wall spoon and produces a representative but disturbed sample. It is used mostly in granular soils. The second type of sampling is obtained with one of many thin-wall tube samplers available, or with the Denison core barrel. Samples obtained with these tools provide a minimum of physical disturbance and are known as undisturbed samples.

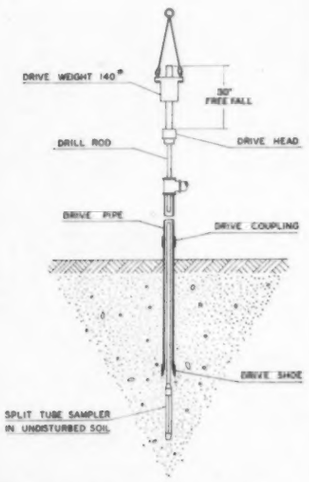


Figure 1. Driving a sample.

Drive (or dry) sampling

When detailed samples of cohesionless granular soils are required, they are taken by the drive sampling method. Samples so recovered are not considered to be undisturbed samples but are known as representative samples. In practice, such samples are identified and classified in the field and then preserved in a moistureproof jar for further reference or laboratory testing.

Specifications almost always call for either drive samples or undisturbed samples to be taken at 5-foot intervals of depth or as indicated by any intermediate change of material. In rare cases where some particular problem warrants the extra expense, samples are taken continuously from the top to the bottom of the hole.

The sample is taken by actually driving a sampler or "sample spoon," Figure 1, into a virgin deposit at the bottom of the bore hole; hence the term "drive sampling" (dry sampling). The bore hole itself can be made by either an auger, a rotary core drill, or driving and jetting casing. Any open hole is satisfactory.

Figure 2 shows a truck-mounted auger rig being used for soils investigation. Figure 3 illustrates a conventional pipe driving and jetting

Figure 2. A truck-mounted Auger rig used for soils investigation.

This is the third of a three-part series on basic procedures of soil sampling. It is intended as a simple guide to the builder or contractor desiring fundamental information about currently accepted methods, procedures, and tools for soil sampling. The articles deal only with securing of the sample, not with laboratory analysis.

rig. It is equipped with a hydraulic drill head for rock coring and for pressing thin-wall tube undisturbed samples. The "built-in" cathead hoist makes the unit ideal for driving and jetting casing.

Three common sample spoons used for drive sampling are shown in Figures 4, 5, and 6. These spoons range in size from 2 to 4½ inches OD. The most popular size is the 2-inch OD. Minimum length is 24 inches in order that a full 12-inch sample can be driven without compaction.

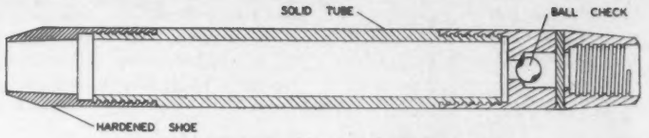


Figure 4. Solid-tube sampler.

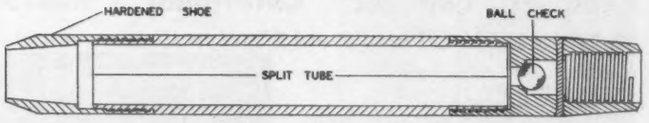


Figure 5. Split-tube sampler.

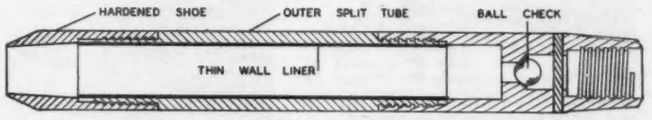


Figure 6. Split tube with liner.

Figure 4 shows the simplest of the drive samplers. This solid-tube sampler is merely a solid-steel tube with a ball check in the head for venting and a hardened-steel shoe for driving. It has the advantage of simplicity and ruggedness. Its only disadvantage is that the sample must be pushed out of the tube endways; this results in a broken-up specimen.

By far the most popular drive sampler is the split-tube sampler shown in Figure 5. This tool has a ball-check head and hardened-steel shoe like the solid-tube sampler, but the barrel of the sampler is split longitudinally. Thus, when the head and the shoe are removed, the barrel opens in two halves exposing the entire sample, Figure 7.

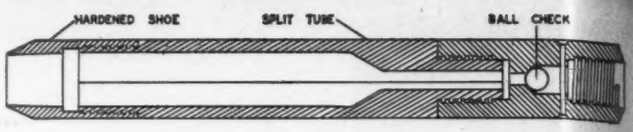
A variation of the split-tube sampler, which contains all the features of the standard split-tube sampler but incorporates a thickened head section to better withstand the heavy pounding these tubes take, is the special Lynac sampler, Figure 8.

An alternate drive sampler having general acceptance is the split tube with liner, Figure 6. The barrel of this sampler is split longitudinally, and has a thin-wall brass or steel liner inserted inside so that the sample can be preserved intact during handling. With the development of thin-wall tube samplers for use in cohesive materials, the split tube with liner has declined in popularity.

Either a trap valve, Figure 9, or a

Figure 7. Split tube open to show the sample.

Figure 8. Lynac sampler.



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spring-type sample retainer, Figure 10, can be used in any of these drive samplers. They are inserted inside of the sampler between the shoe and the sample barrel to help retain a sample in loose or flowing material. However, even with trap valves, it is sometimes difficult to retain a fine flowing sand or quicksand sample.

Securing a sample

Assuming that the hole has already been completed to the proper elevation for sampling by augering, mud drilling, or by driving and jetting, the string of tools shown in Figure 1 is then assembled. The casing or the hole is first cleaned just to the bottom with one of the chopping bits shown in Figure 11; then the split-tube sampler is screwed to the bottom section of the drill rod and

Figure 9. Trap valve.

lowered into the hole. A drive head with guide or jar length is screwed to the top of the drill rod. The tools are now ready to be driven.

A drive weight is used to drive the sampler approximately 12 inches into the undisturbed soil below the bottom of the hole.

Sometimes refusal is met before the full 12 inches is reached. Or, in very soft material, the sampler will go down easily, necessitating extreme caution on the driller's part against overdriving.

When the sample has been taken, the drill rod with sampler attached is rotated two turns to shear off the sample. The drive weight is then used in reverse to bump the rods and sampler upward, free from the ground. After the sampler has been raised to the surface, the split tube

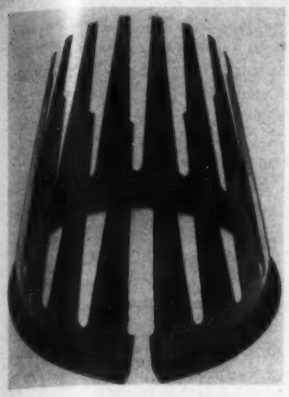

Figure 10. Spring sample retainer.

is opened and the top and bottom layers of the sample are discarded. The balance of the specimen is sealed in an airtight glass sample jar and properly labeled.

Penetration tests

As the science of soils investigation increased in scope, so did the practice of driving samples. It became evident that much useful information could be obtained by recording the number of blows required with a drive weight to drive a sample spoon a given distance.

As time went on, the use of a 140-pound weight falling freely 30 inches to drive a 2-inch-OD×1⅜-inch-ID sampler a distance of 1 foot achieved general acceptance. These specifications became known as the Standard Penetration Test and are now part of the American Society for Testing Materials' tentative specifications for split-barrel sampling.

Figure 12 shows a 140-pound weight being used to drive a 2-inch split-tube sampler. After the sampler has been lowered to the bottom of the hole, it is given a few light taps to seat it and make sure that it is in undisturbed soil. Then, it is continuously driven for 12 inches.

The number of blows required by the 140-pound weight (falling freely for a distance of 30 inches) is recorded. Separate counts are recorded for the first 6 inches of penetration and the second 6 inches.

As might be imagined, there are many conditions under which, because of the consistency of the soil, the 140-pound weight will not drive the sampler the full 12 inches and refusal is reached. Tentative ASTM specifications define refusal as "a penetration of less than 1 foot for 100 blows."

Undisturbed sampling

The term "undisturbed" is relative and somewhat of a misnomer, since no sample is completely undisturbed. It is recognized in the soil-mechanics field that no "undisturbed" sample reaches the laboratory in a completely unaltered state. However, over a period of years, acceptance has been built up for sampling devices and procedures that will produce a core of cohesive material sufficiently undisturbed to be suitable for laboratory testing.

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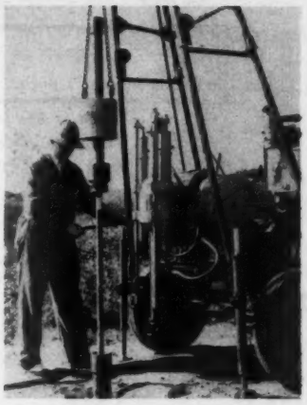
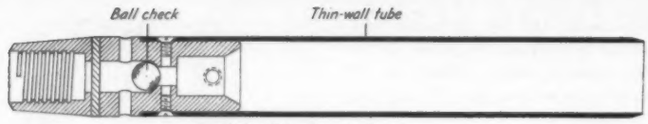


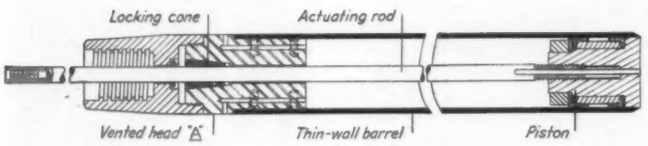
Figure 12. Driving a sampler for the Standard Penetration Test.

Figure 11. Different types of chopping bits.



(a)

Figure 13.



(b)

Figure 14.

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When cohesive materials are encountered in soils explorations, it is mandatory for successful foundation design that an accurate value of the shearing strength of this material be determined. This is done by having a laboratory do a triaxial shear test or unconfined compression test on an "undisturbed" sample of the cohesive material.

Accepted samplers

Aside from special samplers that are available, the following represent the most popular and widely used undisturbed samplers: the Shelby thin-wall tube sampler, Figure 13; the stationary piston sampler, Figure 14; and the Denison sampler, Figure 15.

The basic similarity of these three samplers is that in operation they all recover a sample by pushing a thin tube into cohesive soil. The tube is removed with the sample intact. Sealing the tube and sending it to the lab for analysis completes the procedure. Actually, there is quite a difference in the construction and the use of these samplers.

The simplest and most widely used of the three tools is the thin-wall tube sampler. It consists of a 16-gage thin-wall tube secured to a head containing a ball check valve. The head is threaded to receive standard drill rods.

The bottom of the tube is rolled inward to provide an inside clearance of approximately 1 per cent of the diameter. In practice, the edge is actually turned in more than this, and is then reamed out with a special reamer so that a sharp cutting edge is achieved. In this way, a controlled clearance is obtained that reduces the drag on the inner wall of the tube and the consequent distortion of the sample. Since most cohesive soils have a tendency to swell, the 1 per cent restriction assists in retaining the sample as it is withdrawn from the bore hole.

The ball check valve in the head section vents the inside of the tube to the outside, permitting the rapid escape of air or fluid over the sample as the tube is pushed downward.

The tube length is 18 inches so that a full 1-foot sample can be preserved after the top and bottom have been trimmed to reduce contamination. Longer tube lengths are fairly common on special applications where a longer sample is required.

Material for thin-wall tube samplers is usually commercial-grade seamless tubing. However, when a

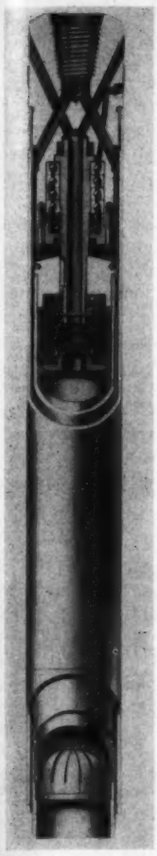

Figure 15. Cutaway section of the Denison core barrel.

long delay between the field recovery of the sample and actual laboratory testing is anticipated, or where the soil under investigation is of an organic nature, such as peat, it is advisable to use brass tubes in place of the steel.

Brass tubes, more expensive and with a greater tendency to deform than steel tubes, are available in the same sizes as standard steel tubes.

Thin-wall tube sampler

The thin-wall tube sampler is always used in virgin, undisturbed soil below the bottom of the casing. Most specifications call for samples at 5-foot intervals or at any change of strata. When the driller has either reached this 5-foot limit or noted a change of strata, through change in the hardness of driving or color and consistency of the return wash water, he stops driving the casing. The hole is then cleaned out just to the bottom of the pipe or a little below. It is important that the driller should know the exact depth in order to positively fix the elevation of the sample.

In hardpan or very impervious hard clay, it is permissible to clean the casing with either a straight or

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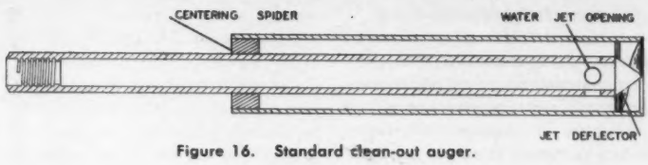

Figure 16. Standard clean-out auger.

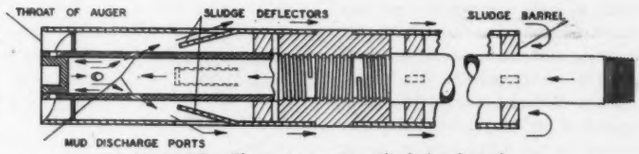

Figure 17. Clean-out auger with sludge barrel.

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cross chopping and jetting bit.

In materials that wash away easily or absorb water rapidly, one of the two types of clean-out jet augers shown in Figures 16 and 17 is recommended. These augers are rotated at the end of a string of drill rods. A flush helix at the bottom of the auger tends to peel upward the soil encountered in the casing. Water jets faced upward catch the soil and wash it to the top of the hole.

When material inside the casing consists of broken pieces too big to be washed to the surface, a clean-out auger with sludge barrel is used. The sludge barrel catches the broken pieces and, when it is full, is returned to the surface and emptied.

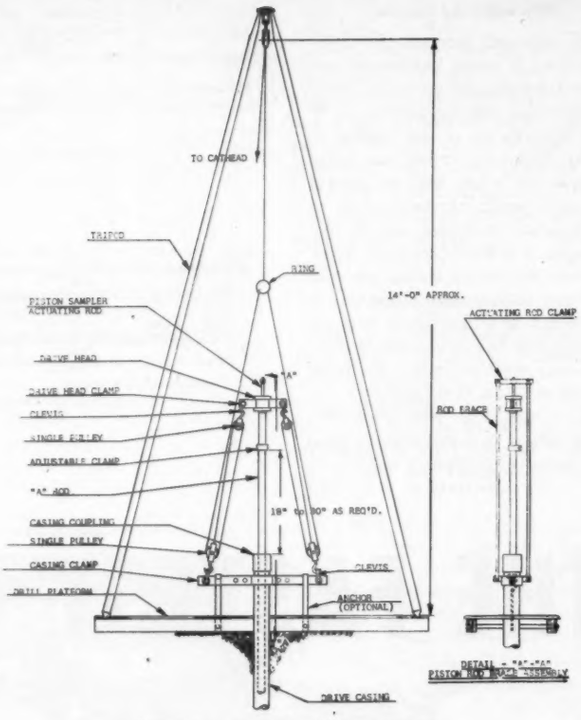

Figure 18. Sample pull-down rigging.

The advantages of this method of clean-out are obvious: the soil below the pipe is not subjected to the hydraulic action of the standard chopping bit; and the strata to be sampled is exposed in a relatively clean, undisturbed condition.

After the cleaning operation is completed, the thin-wall tube sampler is screwed on the end of a standard string of drill rods and lowered into the hole. The top section of this drill string is allowed to protrude at least two feet above the casing pipe.

Pressing the sample

When the sampler is in contact with the soil at the proper elevation, the sample can be pressed by one of three methods. The object, regardless of the method used, is to force the thin-wall tube downward with one fast smooth stroke.

The easiest and best way to do this is to use a hydraulic-feed core drill having a 2-foot stroke. This enables the sample to be taken under controlled conditions. The pressure required to press it downward can be read on the hydraulic gage.

A hand-operated auxiliary hydraulic press can be used to press the sample. With this method, a hand-operated hydraulic pump is used to charge a hydraulic accumulator. The built-up pressure so contained is released at once, pushing the sampler downward. This hydraulic thrust is measured and recorded.

When the only equipment available on the job is a simple wash boring rig with cathead winch, the sample is pulled down with the yoke arrangement, Figure 18. This is just as effective as pressing the sample but does not provide information regarding pressure involved.

Occasionally, very stiff clays or hardpans that simply cannot be sampled by pressing are encountered. These formations can be tested with a Denison core barrel. A less satisfactory method is to drive a thin-tube sampler with a drive weight. While this method introduces greater chances of distortion, it has some acceptance as a field expedient.

Stationary piston sampler

The development of the stationary piston sampler, Figure 14, was a natural outgrowth of the use of the thin-wall tube sampler. It is similar to the thin-wall tube sampler except for the addition of a sealed piston and a locking cone in the head to prevent the piston from moving downward. As a matter of fact, the tubes used on the two samplers are interchangeable. As with the thin-wall tube samplers, longer lengths for the tubes are furnished as semi-standard. Seamless steel is the accepted material for the tube, but brass is also available.

The stationary tube sampler has two principal advantages: it is fully sealed at the bottom so that it can be safely lowered through fluid and soft cuttings without fear of contamination; and by holding the piston stationary and pushing the sampler downward, the top of the sample is completely protected from any distorting pressure at the top. Thus, a much more effective vacuum seal is maintained than with the ball check in the thin-wall tube sampler.

The piston in the stationary piston sampler is mounted on an actuating rod that extends through the head of the sampler and up inside the first section of drill rod. As drill rods are added, sections of actuating rods are added in equal lengths so that the actuating rod always protrudes 6 to 8 inches above the mating drill rod.

Located in the head section of the stationary piston sampler is a spring-loaded locking cone; this permits the head and tube to move downward over the actuating rod but will not permit any movement of the piston in a downward direction. This prevents any possibility of the piston being pushed down or damaging the sample after it has been taken.

With the stationary piston sampler, the hole is prepared for sampling in exactly the same manner as for thin-wall tube samplers. The stationary piston sampler is assembled with the piston in the extended position so that it is flush with the bottom of the tube. It is then connected to the first section of the drill rod, and a comparable length of actuating rod is made up inside the drill rod. In practice, drill rods with actuating rods inside are made up together. This procedure is continued as the sampler is lowered into the hole until the desired depth is reached.

Pressing samples

The actuating rod is now locked in place, holding the piston stationary while the drill rods with piston attached are pressed downward to take the sample. The actual method of pressing can be any one of the three outlined for the thin-wall tube sampler. There is one important difference in this case, however. The actuating rods that extend up through the drill rods must be locked in place so that when the tube moves downward the piston will remain stationary.

Each driller has his own pet rigging for accomplishing this, but a typical arrangement is shown in Figure 18. Although actuating rods are mostly supplied in 5 and 10-foot lengths to correspond with the drill rods, several 1 and 2-foot lengths are handy for adjusting to a suitable height for clamping.

The stationary piston sampler is removed from the hole and disconnected from the drill rods in the same manner as the thin-wall tube sampler. Previously described details concerning the turning of the sam-

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pler to break the vacuum and a delay period before retrieving the sample are equally pertinent in this case.

There is one important difference in procedure between handling thin-wall tube samples and stationary piston samples; this occurs at the time of removal of the sample tube from the head. By studying the cutaway detail of the stationary piston sampler tube and head with the sample in place, Figure 14, it is apparent that, although the head is vented, there is no vent between the piston and the sample. This, of course, is as it should be and is one of the reasons for the success of the stationary piston sampler. The sample is not exposed to any outside pressures or force on the top, and a tight seal is maintained with the resultant vacuum aiding materially in the retention of the sample.

After the sample is taken, the problem is how to remove the tube with its sample in place from the head and piston assembly without distortion from the vacuum between the piston and the sample. By again referring to Figure 14, it will be noted that the piston rod is freely threaded into the piston without any locknut or retaining device. The end of this rod is machined to make an airtight seat in the piston, with the threaded section milled flat on one side. By unscrewing the piston rod a few turns to the left, an airtight seal is released and the vacuum over the sample is broken.

This is a very simple operation, and it must be done each time before loosening the holding screws and removing the sample tube from the head. The tube with the sample is sealed and prepared for the lab in exactly the same way as with thin-wall tube samples.

To prepare the stationary piston sampler for the next test, a new tube is fastened to the head. Head section A is removed, and the spring-loaded locking cone is released so that the piston can be pushed downward into a position flush with the bottom of the tube. It is a good idea to wash all samplers out thoroughly and make sure that the vents are clear and all moving parts free before using them again.

There are several variations of the standard stationary piston sampler. The improved Lowe Acker stationary piston plug sampler is worthy of mention. This sampler represents an advance both in design and the use of improved materials. Standard size for this device is 3½ inches OD.

This improved sampler combines the features of the plug-type sampler with the stationary piston sampler so that the piston can be locked in either an up or down position. When the piston is locked in the down location, it is possible to use the sampler without casing as with the standard stationary piston sampler. Locking in the top position insures against premature movement after the sample is taken.

The sampler features a permanent steel barrel with plastic liners and a thin, elongated stainless-steel cutting shoe. This type of cutting shoe is sturdier than conventional thin-wall tubes and provides minimum distortion. The corrosion resistance of the shoe extends the life of the sampler. This sampler is particularly useful in deeper sampling of heavy clays or where tidal or other conditions make it difficult to maintain casing.

Denison core barrel

The third type of sampler generally accepted as a tool for undisturbed soil sampling is the Denison sampler or Denison core barrel. This sampler makes it possible to recover an undisturbed sample where the thin-wall samplers cannot operate advantageously, as in hardpan, hard clays, highly cemented soils, or extremely stiff deposits. In this type of going, the pressure required to push or even drive the thin-wall sampler is so great that it may cause distortion within the sample or physical damage to the tube itself.

Because the Denison core barrel is a sturdier piece of equipment and is advanced in an entirely different manner, it is very successful under these severe conditions. The design and construction of the Denison sampler are shown in Figure 15. Basically, it is a double-tube core barrel, similar to that used in rock drilling but with a thin, lined inner tube adapting it to soils use. The core barrel can be operated by any standard drill rig capable of using N rods or larger, and it is suitable for use with either clear water or drilling mud.

In operation, it is rotated into the soil either in a cased hole or a hole stabilized with a drilling mud. The inner barrel is of the full-swivel type mounted on antifriction bearings. This barrel protrudes below the cutting bit carried by the outer barrel. The purpose of this protrusion is to insure that the sample is recovered from material undisturbed by the cutting action of the rotating bit; to seal off the sample from water or drilling fluid discharged at the bit face; and to protect the sample from deformation by preventing any rotative drag on the inner barrel. This inner tube remains stationary.

As the Denison core barrel is forced downward with gradually increased pressure, the sample passes through the core retainer into the inner barrel and the very thin-walled liners that act as permanent containers for the sample. Two types of core retainers are used: either the split-ring type, Figure 19, for harder materials, or the basket-spring type, Figure 20, with thin flexible springs for soft soils.

Figure 19. Denison core barrel bottom assembly showing carbide coring bit and split-ring core retainer.

Figure 20. Basket spring-type sample retainer.

Recovering the sample

As the sample pushes upward in the barrel, drill fluid or water on top of it is vented through a disk valve to the low-pressure area on the outside of the core barrel itself. With soft materials, the pressure differential thus created is instrumental in helping to retain the sample. During the sampling operation, fluid flow is cut down as much as is consistent with keeping the bit clean and return cuttings slowly flowing out of the hole. When the full length of sample has been run and the core barrel removed from the hole, the inner tube liner is removed with sample intact and sealed with paraffin in the standard manner for delivery to the lab as a true undisturbed sample.

Because of the large size of the Denison sample, there is less distortion than is found in the smaller thin-tube samples. This bigger specimen can be trimmed in the laboratory to minimize deformation caused by wall friction or the slight drag of the core retainer springs, and sufficient volume exists to prepare several samples from any given horizontal strata of the sample. The Denison core barrel has also been successful in sampling mixtures of gravel and clay, in soft shale, and weathered rock interlaced with clay seams. When an extremely compact formation is encountered, the Denison core barrel is fitted with a regular bottom-discharge bit assembly and conventional split-ring core catcher, Figure 19.

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Vane shear testing

Technically, vane shear testing is not a sampling process, since no physical sample is recovered. However, its extreme accuracy and simplicity of operation have increased the use and popularity of the method, particularly in cohesive soils.

In vane shear testing, a vane is rotated in a cohesive formation, and the torque necessary to shear the soil is measured in inch-pounds. As the vane is rotated, it shears a cylindrical section of earth, and it is a simple matter to compute the unit shearing strength of the soil in pounds per square inch once the total applied torque is known.

Vane shear testing is carried out in cased bore holes. The method of advancing and cleaning the casing is the same as that described in the sections on drive sampling and undisturbed sampling with the thin-wall tube sampler and the stationary piston sampler. Since it is important that the vane be rotated in an undisturbed soil, the final cleaning before testing should be done carefully and, preferably, with one of the two types of clean-out jet augers.

Figure 21 shows an assembly of a typical vane shear test setup. The vane itself is attached to a standard string of drill rods with ball-bearing guide couplings spaced 25 feet apart to overcome friction between the rods and the casing. The entire string of tools is supported on a thrust bearing at the top of the pipe. The vane is rotated from the top with a torque wrench applied to the drill rods.

For in-place shear testing, the vane is pressed 1 to 2 feet into the cohesive material below the casing, with no rotation and as little disturbance as possible. The vane is tapered at the top and bottom to make it easier to press and withdraw. When the vane is properly positioned, it is slowly rotated and the torque, as well as the total angular rotation to produce failure of the soil, carefully noted. The actual soil shear strength is then picked off a torque chart corresponding to the applicable size of the vane being used.

When greater accuracy or an extended program warrants additional equipment expense, an extremely accurate torque head can be substituted for the manual torque wrenches. This head bolts to the top of the casing and supports the tools on a thrust bearing. Torque is applied through a lever arm and proving ring-type force gage.

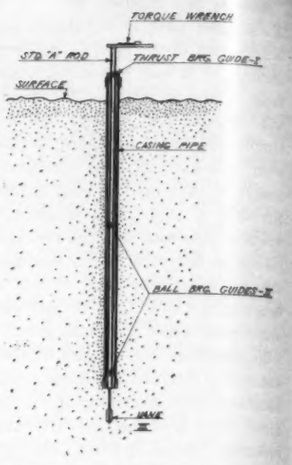


Figure 21. Vane shear assembly.

Core drilling

Core drilling, insofar as soil sampling and foundation test boring are concerned is limited to determining whether a condition of refusal is a boulder or ledge, or whether it is actually bedrock. Specifications usually call for 5 feet or sometimes 10 feet of rock core, and the actual drilling is best left to the judgment of the resident engineer or inspector representative of the design engineer.

Top rock is frequently broken and leached by the action of ground water so that there is sometimes no definite line of demarcation between the overlying soil and the rock. It may be impossible to recover a soil sample and equally difficult to get a good rock core. On the other hand,

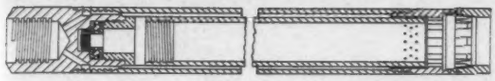


Figure 22. Standard double-tube core barrel.

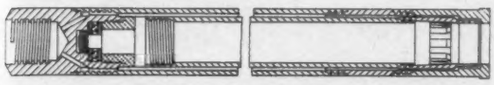


Figure 23. Series M double-tube core barrel.

a large boulder may give every indication of bedrock.

It is customary on any sizable foundation job to require that a number of borings be carried to a sufficient depth to determine the profile and nature of the underlying rock strata. The "top rock" is difficult to core and should be drilled with either a double-tube core barrel, Figure 22, or with a Series M core barrel, Figure 23, which is more effective in recovering rock samples from friable formations.

Any type of drilling machine that will produce a good core, whether it be mechanical screw feed, manual hand feed, or hydraulic feed, is acceptable for rock coring. The bit that is used to cut the rock is generally the diamond bit, but in softer rocks a carbide cutter is sometimes used.

One of the most popular rigs for core drilling in connection with a soils program is the trailer-mounted Teredo drill, Figure 24. This machine combines all the essentials of a drill for soils work with the hydraulic-feed rotary core drilling head. It is assembled on drag skids so that it can be used either on the trailer in easy-to-get-to places or removed from the undercarriage and skidded into inaccessible locations by means of its own wire-rope winch.

Soil sampling and foundation test boring are done for one purpose—the acquiring of information—and the drilling contractor or field man is responsible for reporting data completely and accurately. Each driller or inspector should carry a field notebook or log book for recording all data. Much of the information—such as location, sizes and description of equipment, date—is a simple matter of recording. Ground water levels should be taken every morning and at night in each hole.

Soil samples from dry or drive sampling are permanently stored in wide-mouth screw-top jars that are marked and identified as to job number, hole number, sample number, and the elevation. This identification must be made at the time the driller or inspector places the sample in the jar. Rock cores are kept in compartmented core boxes stenciled with the job or hole number. Undisturbed samples are preserved intact for laboratory analysis, and they should always be protected from shock and extremes of hot or cold.

THE END

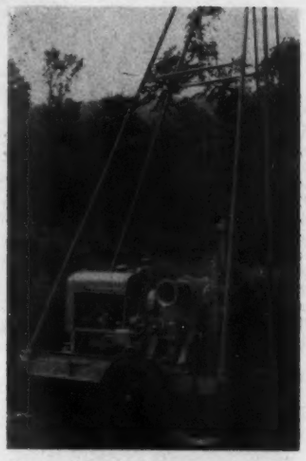
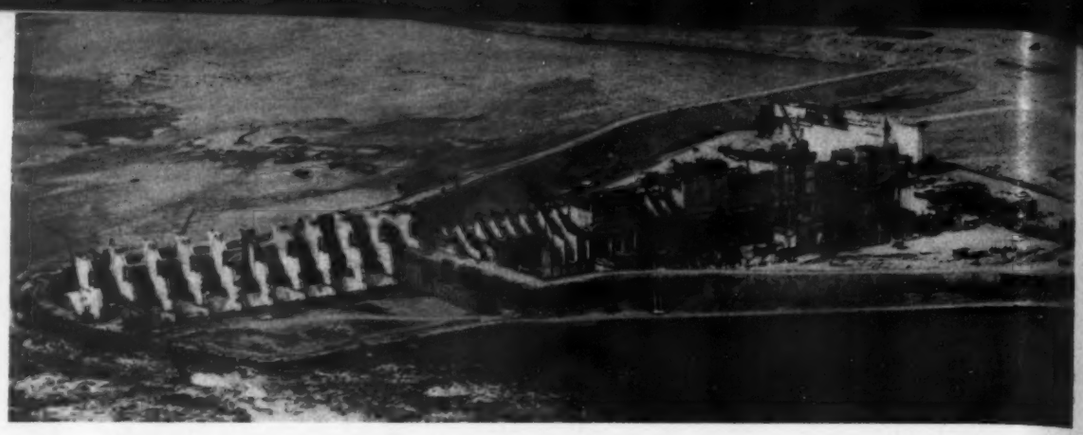


Figure 24. Trailer-mounted Teredo core drill.



Priest Rapids Dam on the Columbia River stands about half completed, putting the job ahead of schedule and the contractor in line for a bonus. Piers for the first 11 of the dam's 22 spillway bays jut into the river area, and the cofferdam is now being removed to permit water to flow through the bays while the remaining spillways are built. The large structure at right is the east-bank fish passage.

These American Revolvers on 80-foot-high gantries use 150-foot booms to serve the powerhouse area. Four of these rigs were on the job, handling such things as form panels, reinforcing, buckets, and structural steel.

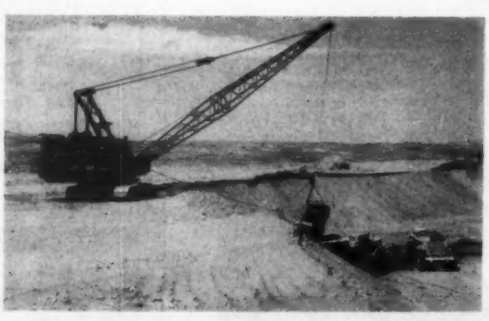
Concrete work for the 1,025-foot-long powerhouse moves swiftly with four American Revolvers sharing the work. At left and center are the water-intake structures with draft-tube exits on the bottom.

This big Manitowoc 4500 dragline with Esco 6½-yard bucket handled a substantial part of the 3 million cubic yards of excavation for the cutoff dikes. Here it loads to a Euclid end-dump. Some of the material was cast and later reclaimed to build the earth embankments.

Planning gives contractor edge on work schedule at Priest Rapids Dam

Construction is well ahead and going forward at a pace that may net a $3.5 million early-completion bonus

A Marion 93-M 2-yard shovel is used to load out the silt, mostly of volcanic origin, which goes into the core of the cutoff dikes. A Euclid hauls the material, while a Cat D8 pushes the silt up to the shovel.



In this pit, which supplied materials for the body of the dikes outside the impervious core, the contractor worked a Marion 111-M dragline, which loads out to Euclid bottom-dumps.

Fast work on Priest Rapids Dam on the Columbia River in Washington means money in the pocket of the general contractor, Merritt-Chapman & Scott Corp., New York, N. Y., as well as that of the owner, the Grant County Public Utility District. And the money can be counted down to the last cent, because of the heavy penalty bonus clause on the huge $82 million dam contract.

The contract allows 1,900 days to complete the work and provides a penalty of $3,000 per day for each of the eight generating units if they are not in operation within the allocated time. The contract also prescribes a

bonus of $1,300 per day for each unit, for early completion.

M-C&S has the work well along on a schedule which, if it can be carried through, will net the company a bonus of some $3.5 million.

Extremely careful planning of each operation, down to the finest detail; a generous amount of big equipment; a working force as large as can be efficiently used in the unusually large area for hydro work; and a few gambles are the essential elements of the contractor's plan. One of the early gambles in cofferdam construction paid a dividend of extra working days in the spillway area.

Concrete dam and earth dikes

Designed by Harza Engineering Co., Chicago, the project consists of a concrete dam and powerhouse reaching 2,427 feet across the main river channel. Earth embankments extend a total of 7,418 feet across the valley to tie the ends of the concrete structure to the valley walls.

Nearly half the length of the concrete structure is the powerhouse section, which was first planned to provide for eight generators and space for the future addition of two more. Present plans call for the inclusion of the additional units in the current construction to give the plant a rated capacity of 830,000 kva. The powerhouse is 1,025 feet long, has a base width of 197 feet, and rises to a maximum height of 178 feet above the lowest excavation. Elaborate fish-handling facilities are incorporated into the left-bank end of the structure.

Rising to a maximum height of 114 feet above the lowest excavation, the spillway section reaches 1,142 feet across the river channel. It will contain 22 tainter gates, each 50 feet high and 40 feet wide.

At the right bank, a 260-foot-long section of concrete gravity dam includes facilities for the right-bank fishways. Adjacent to this section, provision has been made for a navigation lock that will be built in the future by the U. S. Army Corps of Engineers.

Excavation for the earth embankments was carried down to rock and backfilled with several classes of compacted earth. The impervious central core section of compacted material—mostly of volcanic origin—is flanked on both sides by zones of granular filter material. The outer zones are compacted native sand and gravel materials from borrow pits and from the trench excavation.

The left-bank dike extends 4,200 feet straight across the valley, while the right-bank embankment angles upstream to avoid a fault in the lava floor of the valley.

Progress is rapid

At the time the $91,880,625 contract was awarded—in July, 1956—it attracted attention as the largest competitively bid contract in construction history and as a huge project taken on without joint-venture partners. Progress during the first year and a

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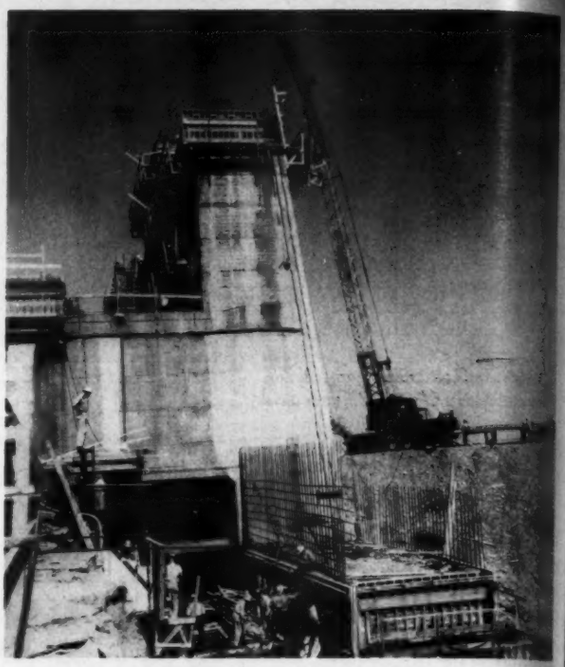
This is part of the big crushing, washing, and screening plant setup to produce aggregates for concrete and processed materials for filter zones of the earth dikes. The plant, with a capacity of about 500 tons per hour, consistently produces 3,000 tons per day or more.

Forming and concrete placement for the intricate fish facilities were among the most difficult phases of the project. The Lorain Moto-Crane is raising one of the prefabricated form panels into place.



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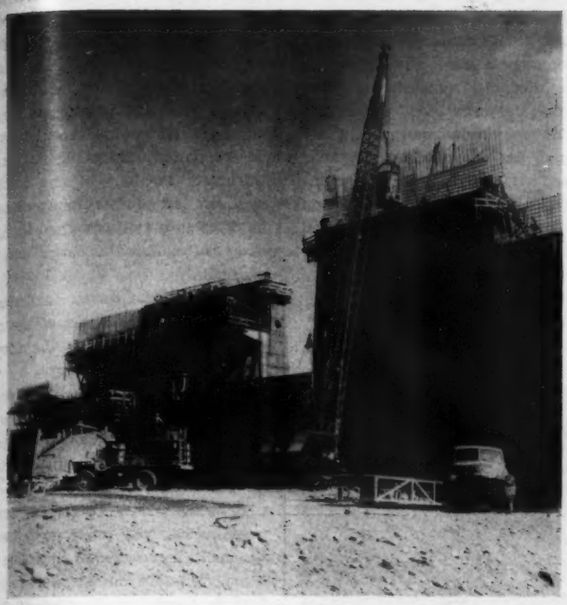
half of the 4-year schedule shows how carefully the job has been planned and managed. At the beginning of last year, the job was well ahead of schedule, and plans for 1958 called for the start of turbine and generator installation in the latter part of the year, plus completion of half the 22-bay spillway and virtually all of the earth embankment. The first commercial power is expected to be produced about July, 1960, when the first eight generators are scheduled to be in place. However, an interim low-head operating agreement has been reached, which will provide for operation commercially in advance of this date. The contractor's bonus would be on a sliding scale under such operation.

This type of bold scheduling has been augmented by careful and thorough planning and decisive action in the field.

Building powerhouse

Concluding that the key to the job was the powerhouse, the contractor enclosed the entire powerhouse area in a single cofferdam designed to withstand anticipated flood levels and thus permit uninterrupted year-round work in this area.

Gravel dikes were built out from the left bank to an island in the river to divert as much as possible of the flow into a channel near the right bank. These dikes, with a single row of sheet piling, form both upstream and downstream sections of the pow-



A Manitowoc 3900 with 100-foot boom, swings a Gar-Bro 4-yard bucket to the forms for the fish-passage facilities adjacent to the powerhouse. Concrete is hauled from the plant by the Euclid truck, which has a rack to handle two buckets and provide a safe platform for workmen.

erhouse cofferdam. At the outer end, a series of sheet-pile cells connects the dikes to complete the enclosure.

The 23 big cells of this cofferdam are 54 feet in diameter with a maximum height of 70 feet. They are filled with gravel, and their top surface, together with that of the gravel dikes, provides a roadway around the area.

While the powerhouse excavation was in progress, the contractor set up four American R-20 Revolvers to serve the area. Each of the big cranes carried 150 feet of boom and was mounted on an 80-foot-high gantry. These rigs handled the form panels, reinforcing, concrete buckets, structural steel, etc., over the entire powerhouse area.

Included in the contract is the excavation of 767,000 cubic yards of rock in the powerhouse and spillway areas. The rock was drilled in maximum 16-foot lifts by a battery of wagon drills powered by four Joy 1,800-cfm stationary compressors. The holes were loaded with Olin Mathieson 40 per cent gelatin dynamite. Most of the shot rock was loaded by a Marion 111-M power shovel and hauled out in Euclid end-dumps.

Since the underlying rock consisted of a series of lava flows, there was seepage along the contact seams between the several flows. This called for the placing of a grout curtain under the concrete portion of the structure and some of the earth dikes.

M-C&S did the diamond drilling and grouting using a British-made Colcrete mixer-agitator and Gardner-Denver grout pumps. Stage grouting was employed, the sequence beginning at 80-foot spacings and working down to 2½-foot intervals. The grouting was carried down to a maximum of 70 feet below the bottom of footings.

While the grouting was in progress, concrete placement started. Euclid trucks with specially built racks each delivered two Gar-Bro 4-yard buckets of concrete from the plant to the powerhouse. The gantry cranes swung the buckets into place, and workmen consolidated the concrete with Chicago Pneumatic vibrators.

Low cofferdam for spillway

Taking a calculated risk, M-C&S started construction of a low cofferdam around half of the spillway area just ahead of the 1957 high-water period. This cofferdam consisted of a series of 36-foot-diameter sheet-pile cells, ranging from 10 to 15 feet high, filled with gravel and topped with concrete. The ends of the low cofferdam joined the corner cells of

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the powerhouse cofferdam.

Pushing this series of cells out against the heavy flow of water would have been a difficult operation, but the contractor worked out a plan to make the job less treacherous. A row of timber cribs was first built out along the upstream side to the end of the cofferdam. These cribs served as piers for a temporary work bridge but permitted the heavy flow of water to pass between them.

Starting at the end of the cribs, the contractor built the steel sheet-pile cells for the outer end of the cofferdam first. When these were completed, stop logs were dropped down between the timber cribs to shut off the flow while the upstream cells were placed. The downstream cells were then built in relatively quiet water.

The job was not finished a day too soon, for this low cofferdam was overtopped by floodwaters the day the concrete was placed to cap the last cell. This was the big gamble: Would the cofferdam withstand the floodwaters and emerge in good condition? The high water did some damage, but most of the cells stood unharmed, and the minor damage was quickly repaired. As soon as the water level dropped sufficiently, the area was unwatered, and work was in progress on the spillway excavation several months ahead of schedule. The gamble had paid off.

When the flood danger was past, the end cells of the high cofferdam were removed to provide free access between the two areas. These cells were replaced and tied in to the end of the powerhouse structure in advance of high water so that work on the powerhouse would not be interrupted. Portions of the spillway were left low so that the water could be diverted over them when the next stage of cofferdam closed off the channel..

An earth dike was constructed on the right bank and part of the concrete gravity section of the dam is being built in this enclosure.

Even with the cofferdams surrounding the work areas, there was a great deal of water to be removed. Seepage entered the areas through the gravel on the land side and through the underlying rocks. To assure ample pumping capacity for the worst conditions, the contractor installed 16 big Byron-Jackson 12-inch vertical turbine pumps, each rated at 5,000 gpm, in sumps in the powerhouse area. Three 1,500-gpm pumps furnish the job water.

Aggregate plant

To produce aggregates for the 918,000 cubic yards of concrete for the structures, the contractor set up a crushing, screening, and washing plant with a production goal of 3,000 cubic yards of material per one-shift day. There is an abundance of good gravel in the natural deposits at the site, but it is deficient in some size ranges, particularly the fine and coarse sand gradings. The plant was, therefore, set up to crush some of the larger sizes to produce the required finer gradings.

Raw material for the aggregate plant is the natural gravel from the left-bank borrow area. This is dug by Marion 111-M and Manitowoc 3500 shovels and hauled to the plant in Euclid bottom-dumps. A Cedarapids 42-inch×14-foot apron feeder puts the pit-run material onto a Symons vibrating bar grizzly that shunts the oversize to a 22×36 Cedarapids primary jaw crusher. All of this material rides a 36-inch belt conveyor to a surge pile.

Another 36-inch belt, fed by Syntron feeders from the surge pile, transports the gravel to a bank of Allis-Chalmers screens consisting of two 5×14-foot triple decks and two 5×12-foot double decks. The coarse aggregates flow from these screens directly to stockpiles, but since there are shortages of some fine gradings, some of the larger sizes are drawn off to be returned to crushers for resizing. These go first to a Symons 3-foot cone crusher or a Symons 4-foot fine bowl cone, with the crushed material being returned to the primary feed belt.

The fine aggregates go through a series of classifiers and blenders to produce the finished sand. The minus No. 8 fraction goes directly to an Eagle 28-foot scalping tank, while the No. 4-to-No. 8 fraction goes to a blend bin. The coarse material from the scalping tank is combined with the

No. 4 to No. 8 and dewatered on an Eagle single screw. The finer fraction is dewatered on an Eagle 36-inch× 25-foot double screw, and both go to storage bins from which they are reblended to produce the finished sand.

The plant also has provision for drawing off material in the ¾-inch to No. 100 range for use in the filter zones of the earth embankments.

Finished concrete aggregates are stockpiled over two 8×8-foot timber reclaiming tunnels fitted with Syntron feeders and Gar-Bro emergency gates. Two-flight conveyors carry the materials to the concrete plant.

Big plant

While the concrete quantities required on the job are not extremely large, the big C. S. Johnson plant is capable of delivering at a rapid enough rate to keep pace with the fastest placing operation. The 6-compartment aggregate bins hold 1,100 tons of materials, and two large silos for cement and pozzolana hold 7,500 barrels each. The cement hopper in the plant is divided to handle both cement and pozzolana.

The completely automatic batching equipment delivers the ingredients to four Koehring 4-yard tilt mixers, which discharge into an 8-yard wet-batch hopper. Job-built racks on Euclid trucks carry two Gar-Bro 4-yard concrete buckets from the plant to the job site, where cranes swing the buckets to the forms.

Pozzolana, which replaces 25 per cent of the cement requirement of the concrete, is produced near the job site from a natural volcanic deposit. The material is calcined and ground in a plant operated by J. H. Wise & Co., Boise, Idaho, and is trucked to the concrete plant in trailer-transports.

In the powerhouse area, the four American Revolvers handle the concrete placement. In other areas, the concrete is placed by crawler cranes. Among these are a Manitowoc 3900 with 100 feet of boom, three Manitowoc 3500 machines, and a big Manitowoc 4500, which joined the concrete operations after completing a major share of the excavation for the earth embankments.

Bridge across river

Building a service bridge across the river as one of the early construction operations illustrates the careful planning of the project. Located just downstream from the dam site, the bridge serves a number of purposes. It carries a railroad spur from the existing tracks on the right bank to the main plant site on the left bank, making carload deliveries of cement and other products possible.

Since the deposits of silt of volcanic origin that make up the impervious core of the dikes are located on the right bank, the "Eucs" hauling this material to the big left-bank dike cross the river on the bridge. The pozzolana plant is located on the right bank, and all of this material is trucked across the bridge to the concrete plant on the left bank. The bridge also provides access for workmen. The dam is situated at a remote location, and most of the 1,500 or more workmen commute daily from towns many miles away. The bridge makes it feasible for them to live on either side of the river.

Building earth dikes

Draglines handled practically all of the excavation for the earth dikes, with one machine doing a big share of the work. This was a Manitowoc 4500 carrying 120 feet of boom and using a 6½-yard Esco bucket. This rig cast most of the material to the side into spoil banks, which were later reclaimed to build portions of the embankments.

The trenches for the embankments were excavated down to bedrock, which ranged from less than 40 to more than 80 feet below existing ground. Sideslopes were excavated to a slope of 1½ to 1. These big trenches accounted for a large share of the 3,239,000 cubic yards of excavation in the project.

As the excavation was completed, the rock was pressure-grouted and the placing of the 3,352,000 cubic

(Continued from preceding page)

yards of embankment began immediately.

The deposit of silt of volcanic origin on the right bank also provided the material for the impervious central core of the dikes. This silt was processed at the pit, pushed into a stockpile by a D8 tractor-dozer, and loaded into Euclid bottom-dumps by a Marion 93-M shovel. As the "Eucs" dumped, the material was watered, spread, and compacted. The first courses were compacted with air-powered tampers. Succeeding courses were compacted by four passes of a Southwest sheepsfoot roller pulled by a D8.

Processed filter material for the zones adjacent to the core was produced in the aggregate plant and delivered to the dikes by "Eucs."

Gravel for the outer portion of the embankments came from the trench excavation and from a large pit on the left bank upstream of the dam. Several shovels and draglines loaded a steady stream of Euclid end-dumps and bottom-dumps in this big pit. Some of the material went to the aggregate plant, but most of it went directly into the embankments where it was compacted by rolling.

Personnel

Head of the supervisory staff for Merritt-Chapman & Scott Corp. is project manager Robert J. Jenks. He is assisted by project superintendent Russell Hoffman, project engineer George Gothro, purchasing agent Ray Hill, equipment superintendent Burton Louis, and master mechanic Joe Hamby. Operations are under the over-all direction of William Denny, M-C&S executive vice president in charge of the Construction Department.

The resident engineer for Harza Engineering Co. is Robert B. Jackson. His staff includes assistant resident engineer B. A. Hall, office engineer W. L. Scearce, and field engineer Ed Helgren. G. A. Smothers is manager of the Public Utility District of Grant County.

THE END

Big openings for contractors in watershed program

New opportunities for earthmoving contractors are detailed in two booklets from Allis-Chalmers Mfg. Co. The March-April, 1959, issue of "Reporter," the external house organ of the Tractor Group's Construction Machinery Division, contains pertinent data on the watershed program; what it means to contractors; and its earthmoving equipment requirements.

This booklet gives statistics on 123 watershed projects—authorized for operation as of July 31, 1958—that represent an earthmoving job of more than 82 million cubic yards for floodwater structures and channel improvement. This program is moving at a rate of 100 new projects per year. At least 4,000 watersheds could be developed under the Watershed Protection and Flood Prevention Act.

"Reporter" also supplies data on structural and land-treatment measures, a state-by-state breakdown on the status of watershed applications, and an estimate of earthmoving for all conservation projects in fiscal 1957–58.

"New Opportunity in Soil and Water Conservation for Farmers and Contractors," the other booklet, explains and illustrates the many jobs that comprise the program.

Information on earthmoving opportunities in the conservation field can be obtained from soil-conservation districts in each state, or from the State Conservationist, U. S. Soil Conservation Service, Washington, D. C.

Free copies of both booklets are available from the Sales Promotion Department, Tractor Group, Construction Machinery Division, Allis-Chalmers Mfg. Co., Box 512, Milwaukee 1, Wis.

Management

Purchasing: Fundamentals of the Purchasing Department

This is the forty-first of a series of articles on Construction Management by George E. Deatherage, P. E., consultant to National Schools of Construction Management and Heavy Equipment Operation, P. O. Box 527, Weiser, Idaho, and P. O. Box 8243, Charlotte, N. C. The articles are based on an eight-volume "Manual of Advanced Construction Management," published by the National Schools. The manual is used in a training course for superintendents and project managers, and is directed primarily at those contractor employees at the foreman level or its equivalent, who need practical help in order to take complete charge of construction projects themselves.

by GEORGE E. DEATHERAGE, P. E.
construction consultant

The manner and method of handling purchasing will vary with the size and nature of a job; the extent of the organization; and whether or not the purchasing is done at the main office, on the job, or split between the two. It will also depend on whether or not auxiliary service functions—such as expediting, supervision of stockrooms, receiving of materials—are under the direction of the purchasing agent or allocated to other departments.

The purchasing agent must not only know the mechanics of purchasing, market sources, and market prices, but he should also be able to read drawings, interpret technical specifications, and in many cases prepare them to meet specific and technical requirements. He will need to be familiar with contracts and subcontracts in both a technical and a legal sense, and be able to draw contracts to satisfactorily meet the job requirements.

To help the purchasing agent buy items for a job, there should be a number of Purchasing Data Sheets on file for every commodity regularly purchased.

Suppose, for instance, a sheet is made up for the item of steel sash. All the usual questions relating to the purchase of this material are, when the sheet is completely filled out, answered in the light of the latest information. This consolidation of purchasing data, prepared under the direction of the purchasing agent or by a research analyst in the department, is available to the buyers. Thus, when a buyer receives a requisition for the purchase of steel sash, he can, by referring to the purchasing data file, secure practically all the information that he will need to request quotations and make the purchase.

It is important that such data sheets be kept up to date at all times. When any additional information is secured, these sheets should be revised at once.

As far as the Purchasing Department is concerned, a Material Cost Record, Figure 1, and Material Cost Summary, Figure 2, are made out for each commodity purchased and are attached to the purchasing data

MATERIAL COST RECORD

Item_____

Date	WP No.	PO No.	Supplier	No Pcs	Material	Unit Price	Discounts	Nt. U.* Price	* Frght	FOB	Remarks

*Net Unit Price
*Freight

Figure 1.

(Continued from preceding page)

file. Each time a purchase of this commodity is made, an entry is completed on the record, showing date, Purchasing Order number, supplier, price, etc., to establish a continuous price record for that specific item.

This record is not only indispensable to the buyer but is the prime source of information for the estimating section or anyone else in the firm.

Purchasing and the estimate

When a construction contract is signed, the Purchasing Department or purchasing agent should be supplied with a copy of the estimate as an aid in purchasing. The estimate shows the approximate quantities of materials required and the estimated unit prices.

If it is clear that materials are going to cost more than the amount estimated, the purchasing agent must try to secure acceptable substitutes at lower prices, to combine the purchases with those for other work or, in cases of cost-plus and fixed-limit contracts, to redesign or simplify structures and the materials used in them. In any case, the matter should be brought to the attention of a higher authority so that responsibility may be fixed and the project manager freed of responsibility.

The original source of a Purchase Order should be the requisition prepared from a Bill of Material which, in turn, has been prepared from the plans and specifications and checked against the estimate. Before equipment is purchased, it is a good idea to make out a requisition for the estimated quantity of materials. If this runs higher than estimated, the requisition should also be referred to higher authority for approval. If a requisition is not being used, the estimate should be consulted for quantity before the Purchase Order is written and issued. The estimate, which is private information, should be retained in the files of the purchasing agent and issued only to authorized persons.

Preliminary work

The purchasing agent should frequently consult work plans and should always be supplied with the latest set, including all the details.

The first Purchase Order to be written must be for insurance to cover all items to be used. Since the purchasing agent must know what materials are needed he should be supplied with and maintain a copy of job specifications and plans. Job specifications rarely detail every piece of material needed; the purchasing agent should get complete information from the contractor.

When design reports, item lists, and machine specifications are available, copies should be sent to the Purchasing Department. Purchasing may not be based on this information, but at least the agent can use the material to come to sound decisions. Among the first items to be supplied to all concerned are the correct shipping addresses for local and carload freight, correct addresses for express shipments, and job mailing addresses and phone numbers.

Copies of all time and progress

schedules must be sent to the purchasing agent so that he can get the material on the job at the right time. If material is delivered before it is wanted, extra handling and storage will be necessary.

Bills of Material are the basis for writing a purchase requisition to the Purchasing Department. B/M's flow from the Engineering Department into Planning and Production, where they are consolidated, processed, and the requisitions prepared. Whether or not an Engineering Department, Planning and Production division, or similar type of organization is maintained, the work remains about the same and must be done before a purchase can be initiated.

Figure 2.

MATERIAL COST SUMMARY

Geo. E. Deatherage & Son

W. O. No._____
Class No._____
Dist. No._____

COMMODITY_____

VENDOR	P.O. No.	Description	Quantity	Amount	Monthly Total

Quite often the superintendent or project manager on small jobs may have to do all these things personally, even down to purchasing and expediting the delivery. In other cases he may have only one assistant in the office, a combination chief clerk and purchasing agent.

Requisitions

A requisition may call for one or several types of material handled by vendors; the identical items on the requisition are carried on the Purchase Order. In specific cases, a separate requisition form can be used, Figure 3. There are numerous variations of this form, but the main features remain the same.

Requisitions are not made to an outside vendor unless the items, in part or as a whole, are not available in stores stock or as surplus or salvage. If B/M's are made, each item is checked for these possibilities and the findings noted in the Remarks column. If the material is to be secured on the site, the requisition is made out to the storekeeper, and copies are sent to all concerned.

If material is to be purchased outside, the requisition is placed in the hands of the buyer for that specific commodity. On large work, the buying is divided into two divisions: for local buyers and out-of-town buyers. It simplifies operations to have all local purchases made by one man.

The reverse side of the requisition can be used to note the prices received on a specific item from various vendors.

Authority for purchases

There are only three sources to authorize purchases. The authority may come from B/M's, originating in the Engineering Department, comprising materials or equipment called for on the estimate or in the item lists of the design reports. It may come from requisitions that cover materials, equipment, supplies, tools, etc., and originate in the field or in Planning and Production, and are countersigned by the superintendent or project manager. And it may come from requisitions, originating with the chief storekeeper to maintain storeroom stocks, that are countersigned by the chief of planning or the superintendent or project manager.

Authority may be delegated to various other persons to sign requisitions,

Requisition No. _____

REQUISITION FOR MATERIAL

To be invoiced to _____ Date Wanted _____
(Company & Address)

Deliver to _____

Charge to _____ B/M No. _____

To be used for _____

Bal. on Hand	Date of Last ord.	Charge to Symbol Account	Quantity	Unit	Specifications	Price

Figure 3.

(*Continued from preceding page*)

but in every case such authority should be in writing and a copy sent to the purchasing agent, who maintains an up-to-date list of authorized persons for the guidance of the buyers.

When copies of Purchase Orders are presented for final signature, they should always be accompanied by either the requisition or a copy of the B/M. If the order requires labor to be performed on the site, the subcontract must be substituted for the Purchase Order to insure that all requirements for insurance are met.

All necessary drawings, sketches, specifications, B/M's, and other pertinent data should be in triplicate and attached to the requisition sent to the purchasing agent, so that at least three prices may be secured. If more copies are required, the purchasing agent can requisition them. Such drawings, specifications, etc., may be stamped "preliminary," "for prices only," "approved for construction," as the case warrants.

In cases where subcontracts are involved, the accompanying document may well include a draft of the subcontract prepared by someone in the Engineering Department or superintendent's office who is familiar with the details.

After the requisition reaches the purchasing agent, the purchasing data file is consulted for a list of vendors, prices, deliveries, etc., to give the background on similar purchases in the past.

Request for quotations

A request for a quotation can be handled in various ways. It can be done by sending out a post card asking the vendor or subcontractor to

For more facts, use Request Card at page 18 and circle No. 346

For more facts, circle No. 347

GEO. E. DEATHERAGE & SON

REQUEST FOR QUOTATION

B/M No. _____
Req. No. _____

Gentlemen:

Please quote us in duplicate price each for lot on the material specified below. Quotations to advise Terms of Payment: cash discount: shipping point; F.O.B. Point and time required for shipment. Reply to be received not later than _____ to receive consideration. We reserve the right to accept all or part of your quotation unless specifically stated to the contrary.

THIS IS NOT AN ORDER INQUIRY ONLY

Figure 4.

call, examine the drawings, and secure other information as may be needed to make his price or bid.

In other cases, there may be a sheet listing all the items on which prices are required. In this case, a form similar to that shown in Figure 4 can be used. Copies of these requests are kept with the requisition until the quotations are received and the Purchase Order written.

Prequalification of vendors may be settled by referring to the purchasing data sheets. If the information is not available from that source, the purchasing agent may have to consult a Dun & Bradstreet report or those of commercial credit agencies.

(Next month's article will deal with "Purchasing: Buying for a Job.")

Sika names engineer

Don L. Emden has been appointed sales engineer for Sika Chemical Corp., Passaic, N. J. From headquarters in the firm's New Orleans district office, Emden will serve architects, engineers, contractors, and ready-mix-concrete producers in Louisiana and Mississippi.

Two Eimco men named officers of the AIME

Wayne L. Dowdey and Ewald Kipp, both of The Eimco Corp., Salt Lake City, Utah, have become officers in divisions of the American Institute of Mining Engineers. Dowdey, who is Eimco's regional manager of the Birmingham and Pittsburgh districts, is chairman of the Minerals Beneficiation Division. Kipp, special representative for Eimco, is a director of the Society of Mining Engineers, another division.

WORK ON CONSTRUCTION, general maintenance, snow removal, right-of-way cleanup, and stockpile load-out are some of the jobs handled by this Model HU Payloader tractor shovel for the highway department of Gates, N. Y. Equipped with a Drott 4-in-1 bucket, the rig has a rated carrying capacity of 2½ tons and a 4-ton lift capacity.

Octagonal-shaped building to rise in New York City

One of the world's largest commercial office buildings, Grand Central City in midtown Manhattan, will be in the form of an elongated octagon. The 55-story structure, containing 2.4 million square feet, is planned for completion in 1962 at a cost of $100 million.

Highlight of the building is a slender multifaceted tower, set off by two transitional levels from a broad 6-story base that ties into and continues the horizontal roof line of the adjoining Grand Central Terminal. The structure emphasizes eight separate surfaces enclosed in an envelope of metal, masonry, and glass. Relieving the straight vertical ascent of the tower will be two recessed surfaces extending around the entire perimeter of the building.

In the steel-erection plan, column spans as long as 32 feet will bridge railroad tracks over which the new building will stand, and thus eliminate intervening load-bearing members.

Product LITERATURE

To obtain free copies of any of the literature described in the following section, circle the designated number on the Request Card at page 18.

Portable ready-mix plant—literature describing the benefits of a portable ready-mix plant made up of the Travel-Batcher "twins"—the firm's portable cement silo, with capacities up to 350 barrels, and the versatile Travel Batcher itself, offering production rates up to 100 yards per hour. Text illustrated with drawings and photographs.

Write to the Travel Batcher Corp., Dept. C&E, 6450 Holladay Blvd., Salt Lake City, Utah, or use the Request Card at page 18. Circle No. 107.

Blasting cost chart—a hip-pocket blasting cost chart for making quick, orderly cost records while drilling, loading, and shooting a blast. Can be used for comparison purposes to determine what methods are most economical, and, for many jobs, it will provide an adequate permanent cost record.

Write to the Atlas Powder Co., Dept. C&E, Concord Pike and New Murphy Road, Wilmington 99, Del., or use the Request Card at page 18. Circle No. 120.

Friction and fluid drives—a condensed specification bulletin on all Twin Disc friction and fluid drives. Twenty pages of engineering data, schematics, dimensions, and other pertinent information. All information on a particular unit contained on one page for easy reference. Bulletin No. 314.

Write to the Twin Disc Clutch Co., Dept. C&E, Racine, Wis., or use the Request Card at page 18. Circle No. 19.

All-purpose diesels—a brochure describing the wide selection of industrial and automotive engines available in GM's new all-purpose diesel power line. Gives power ratings and over-all dimensions on over 100 in-line, "V," and turbopower engine models.

Write to the Detroit Diesel Engine Division, General Motors Corp., Dept. C&E, 13400 W. Outer Drive, Detroit 28, Mich., or use the Request Card at page 18. Circle No. 78.

Magnetic drill stands—a bulletin describing precision-drilling possibilities in difficult or remote areas with the use of magnetic drill stands whose base "locks" to any ferrous surface. Also explains how dismantling heavy machinery or building expensive rigging for drilling work can be avoided with magnetic stands. Bulletin No. 10406.

Write to the Thor Power Tool Co., Dept. C&E, 175 N. State St., Aurora, Ill., or use the Request Card at page 18. Circle No. 118.

Joint-sealing equipment—a pamphlet describing Cutler concrete-joint-sealing equipment. Stresses Models MA-600 and MA-150 melter-applicators; other units also described and illustrated.

Write to the Cutler Engineering Co., Dept. C&E, 5435 W. 63rd St., Chicago 38, Ill., or use the Request Card at page 18. Circle No. 40.

Steam cleaners—a folder detailing the construction and operating characteristics of Turbo electric and oil-fired steam cleaners. Application data; photographs; specifications.

Write to the Turbo Machine Co., Dept. C&E, 840 W. Main St., Lansdale, Pa., or use the Request Card at page 18. Circle No. 63.

Self-propelled roller—a well illustrated bulletin describing the Rosco Model SR-9-T2 self-propelled 9-wheel pneumatic-tire roller. Complete specifications included.

Write to the Rosco Mfg. Co., Dept. C&E, 3118 Snelling Ave., Minneapolis 6, Minn., or use the Request Card at page 18. Circle No. 12.

Cold patching—a 24-page booklet giving detailed instructions on how to repair roads and streets by the cold-patch method. Photographs illustrate proper procedure. Tables give recommended quantities of asphaltic material and aggregates to be used.

Write to The Texas Co., Asphalt Sales Division, Dept. C&E, 135 E. 42nd St., New York 17, N. Y., or use the Request Card at page 18. Circle No. 60.

Lightweight pump—a fact sheet on the Construction Machinery Co.'s Model 7M-LW lightweight 2-inch dual-prime pump, rated at 7,000 gph.

(Continued from preceding page)

Includes specifications and a capacity table in gpm.

Write to the Construction Machinery Co., Dept. C&E, 447 Vinton St., Waterloo, Iowa, or use the Request Card at page 18. Circle No. 42.

Vibratory material-handling equipment—a catalog covering the wide variety of Syntron vibratory material-handling equipment. Well illustrated with photographs, sketches, dimensional drawings, tables, and charts. Includes specifications for each unit.

Write to the Syntron Co., Dept. C&E, 227 Lexington Ave., Homer City, Pa., or use the Request Card at page 18. Circle No. 44.

Hydraulic-drive conveyor—literature detailing 11 major benefits offered by the Morgen hydraulic-drive conveyor, which is available in lengths of 24, 32, and 40 feet. Includes specifications and photographs.

Write to the Morgen Mfg. Co., Dept. C&E, 1115 N. Broadway, Yankton, S. Dak., or use the Request Card at page 18. Circle No. 26.

To obtain the literature described on this page, write to the manufacturer or circle the designated number on the Request Card at page 18.

Wire slings—a booklet describing the benefits of Gripper woven-wire slings. Covers advantages, typical uses, technical data, and specialties. Well illustrated with photographs, drawings, and tables. Specifications.

Write to the Cambridge Wire Cloth Co., Dept. C&E, Cambridge, Md., or use the Request Card at page 18. Circle No. 41.

Hydraulic vertical drill—a pamphlet on the Parmanco (Jeep-mounted) Model F-86 hydraulic vertical drill designed to handle augers from 3 to 12 inches in 5-foot sections. Text illustrated with photos; specifications included.

Write to the Paris Mfg. Co., Dept. C&E, 1401 S. Main St., Paris, Ill., or use the Request Card at page 18. Circle No. 87.

Form hardware—literature describing how Simplex step hardware solves multilevel foundation problems. Shows how forms can be stepped up or stepped down from one level to another. Text illustrated with photographs and drawings.

Write to Simplex Forms System, Inc., Dept. C&E, 5605 Industrial Ave., Rockford (Loves Park), Ill., or use the Request Card at page 18. Circle No. 49.

Pipe piles, caissons, pile shells—a catalog on Armco pipe piles, caissons, and Hel-Cor pile shells. Tells where the products are used, and why; gives data on typical installations, field operations, and how to specify. Also includes tables on dimensions and weight, pile-driving hammers, and data for computing pile bearing capacity. Catalog FP-13558.

Write to Armco Drainage & Metal Products, Inc., Dept. C&E, 703 Curtis St., Middletown, Ohio, or use the Request Card at page 18. Circle No. 99.

Equipment leasing plan—literature on a special package lease plan for the construction industry, under which any combination of equipment may be considered as one package and leased as a unit for 3 to 5 years. Tells how large and small firms may acquire equipment valued at $10,000, $25,000, $50,000, or more without capital investment.

Write to the Nationwide Leasing Co., Dept. C&E, 11 S. LaSalle St., Chicago 3, Ill., or use the Request Card at page 18. Circle No. 76.

Tooth points—literature describing the benefits of Dragon Tooth points for shovels, draglines, loaders, hoes, rippers, scarifiers, dozers, clamshells, and trenchers. Gives sizes and weights for a variety of points.

Write to the Village Blacksmith Division, General Metals Corp., Dept. C&E, Watertown, Wis., or use the Request Card at page 18. Circle No. 43.

Asphalt calculator—a pocket-size calculator designed to simplify calculations of square footage and number of tons of asphaltic material needed for any paving job. Available in both plastic and plastic-coated Toughcheck.

Write to Hogan & Vecchio, Dept. C&E, 3713-A Arlington Ave., Riverside, Calif., or use the Request Card at page 18. Circle No. 13.

Asphalt batch plants—a brochure illustrating and describing the new line of Bollard asphalt batch plants available in stationary and transportable units with 75 to 200-tph capacities. Details the construction of such major components as the

dryer, pugmill-type mixer, control panel, dust-collecting units, hot elevator, hot storage bins, as well as many smaller components.

Write to the Bollard Asphalt Plant Division, The Colonial Iron Works Co., Dept. C&E, 17643 St. Clair Ave., Cleveland 10, Ohio, or use the Request Card at page 18. Circle No. 51.

Diamond-blade care—a technical brochure on the care and treatment of diamond blades. Data on selection and use; also discusses how to extend useful cutting life and reduce cutting costs.

Write to the Cardinal Engineering Corp., Dept. C&E, 144 Burnside St., Philadelphia 27, Pa., or use the Request Card at page 18. Circle No. 66.

Portable pumps—a brochure on Hale Torrent pumps for a variety of applications. Describes and illustrates the Model 20T gasoline-engine-driven unit; Models 15TP and 20TP pedestal pumps adaptable to available power; and Models 15TPE and 20TPE electric-motor-driven units. Brief specifications.

Write to the Hale Fire Pump Co., Dept. C&E, 708–716 Spring Mill Ave., Conshohocken, Pa., or use the Request Card at page 18. Circle No. 65.

Hose and fittings—a catalog of Stratoflex hose assemblies, re-usable fittings, and all-purpose hose for a wide variety of applications. Includes specifications and is illustrated with photographs and drawings.

Write to Stratoflex, Inc., Dept. C&E, P. O. Box 10398, Fort Worth, Texas, or use the Request Card at page 18. Circle No. 71.

Buckets—a brochure on Chicago dual-lever-arm buckets. Data on models for digging, dredging, general purpose, and rehandling. Stresses the dual-arm feature, as well as simple cable reeving and guarded closing sheaves. Photos illustrate text.

Write to Chicago Buckets, Inc., Dept. C&E, 3820 S. Laramie Ave., Chicago 50, Ill., or use the Request Card at page 18. Circle No. 52.

Diesel-powered compressor—literature describing the Irmer & Elze Type D601-R air-cooled compressor powered by a Deutz diesel engine. Gives brief specifications for both engine and compressor. Illustrated with photographs.

Write to Air Compressors, Inc., Dept. C&E, P. O. Box 2976, Jacksonville, Fla., or use the Request Card at page 18. Circle No. 105.

Welding equipment—a brochure evaluating 50 important design features found in oxyacetylene welding and cutting equipment and industrial regulators produced by 19 leading manufacturers. Illustrated with cross-section drawings.

For further information write to the Modern Engineering Co., Dept. C&E, 3411 Pine Blvd., St. Louis 3, Mo., or use the Request Card at page 18. Circle No. 79.

Portable batching plant—a bulletin describing the new Clark Trans-Plant, a portable unitized batching plant. Illustrated with photographs including close-ups of major components. Bulletin CB-100.

Write to Clark Industries, Construction Equipment Division, Dept. C&E, 375 E. Fifth Ave., Columbus 1, Ohio, or use the Request Card at page 18. Circle No. 98.

Car shaker—a fact sheet on Syntron's unbalanced-motor vibrating car shaker. Electrical and mechanical data; specifications.

Write to the Syntron Co., Dept. C&E, 227 Lexington Ave., Homer City, Pa., or use the Request Card at page 18. Circle No. 5.

Wire-rope inspection—a folder describing a program of wire-rope inspection to insure maximum operating safety and efficiency at minimum cost. Includes advice on frequency of inspection, point-by-point checkup, inspection of equipment, and how to evaluate findings.

Write to H. K. Porter Co., Inc., Leschen Wire Rope Division, Dept. C&E, 2727 Hamilton St., St. Louis 12, Mo., or use the Request Card at page 18. Circle No. 77.

Blasting materials—an 82-page catalog listing Hercules explosives, blasting agents, and blasting supplies. Includes a 2-page summary of the properties of the firm's explosives, plus an index to a complete description of each.

Write to the Hercules Powder Co., Dept. C&E, Delaware Trust Bldg., Wilmington 99, Del., or use the Request Card at page 18. Circle No. 31.

Locomotives—a brochure covering both gasoline and diesel-powered Plymouth locomotives for underground applications. Includes descriptions and specifications for 4 and 6-wheel cab-in-front models, compact Mine-o-motives, and heavy-duty tandems. Photographs illustrate text.

Write to the Plymouth Locomotive Works, Division of The Fate-Root-Heath Co., Dept. C&E, Plymouth, Ohio, or use the Request Card at page 18. Circle No. 106.

Portable, submersible pump—a folder describing the Stenberg Model B-150/200L submersible, portable electric pump. Illustrated with charts, photographs, and drawings.

Write to the Stenberg Mfg. Corp., Dept. C&E, N. Hoosick, Hoosick Falls, N. Y., or use the Request Card at page 18. Circle No. 10.

Concrete forms—a pamphlet describing Superior All-Ply panel forms for all types of concrete forming. Stresses the units' one-working-part design. On-the-job photographs illustrate a wide range of applications.

Write to Superior Concrete Accessories, Inc., Dept. C&E, 9301 King St., Franklin Park, Ill., or use the Request Card at page 18. Circle No. 75.

Lightweight earthmover—a fact sheet on the Agricat Model F long-track earthmover, described as especially efficient in tight-spot work. Includes photographs, specifications, and data on optional attachments.

Write to the Agricat Equipment Co., Dept. C&E, 5353 Lancaster Ave., Philadelphia 31, Pa., or use the Request Card at page 18. Circle No. 67.

Antifriction lubricants—a folder on the uses and applications of two new Whitmore antifriction lubricating compounds said to have no melting or dropping point. Gives test data

To obtain the literature described on this page, write to the manufacturer or circle the designated number on the Request Card at page 18.

Product Literature

and information on performance characteristics.

Write to The Whitmore Mfg. Co., Dept. C&E, Drawer 160 Sta. "C," Cleveland 4, Ohio, or use the Request Card at page 18. Circle No. 102.

Pipeline compressors—a bulletin presenting new advances achieved by the Clark Bros. Co. to increase substantially the operating efficiency of reciprocating pipeline compressors. Also introduces a new concept for rating and comparing compressors. Generously illustrated. Bulletin 168.

Write to the Clark Bros. Co., Division of Dresser Industries, Dept. C&E, Olean, N. Y., or use the Request Card at page 18. Circle No. 95.

Truck-mixer discharge-chute control—a brochure on the Monarch Dyna-Chute, a device that lifts and lowers a truck-mixer discharge chute by electric hydraulic control. Illustrated with on-the-job photos.

Write to the Monarch Road Machinery Co., Dept. C&E, 1331 Michigan St. N. E., Grand Rapids 3, Mich., or use the Request Card at page 18. Circle No. 33.

Electric generators—a folder describing the complete Onan line of separate electric generators. Precise specifications of the various controls—ac switchboards, rheostats, wall-mounted switchboards, and manual transfers—are described and illustrated. Folder F-141.

Write to D. W. Onan & Sons, Inc., Dept. C&E, 2515 University Ave. S. E., Minneapolis 14, Minn., or use the Request Card at page 18. Circle No. 48.

Road-building equipment—a catalog covering the full Seaman-Gunnison line of road construction and maintenance equipment. Includes on-the-job photographs, close-ups of major components, and brief spex. Catalog No. SG-25.

Write to the Seaman-Gunnison Corp., Dept. C&E, 2763 S. 27th St., Milwaukee 15, Wis., or use the Request Card at page 18. Circle No. 74.

Asphalt-surface treatment—a manual designed as a practical guide to the best methods and practices in the selection and application of treatments for asphalt surfaces. Illustrated with photographs, drawings, and tables.

Write to the American Bitumuls & Asphalt Co., Dept. C&E, 320 Market St., San Francisco 20, Calif., or use the Request Card at page 18. Circle No. 28.

Perforated roller—a fact sheet listing the design and operating characteristics of the Eeco Crusher-Pak perforated roller. Contains general specifications, and is illustrated with photographs.

Write the Eskridge Equipment Co., Dept. C&E, 1214 S. Norwood, Tulsa 12, Okla., or use the Request Card at page 18. Circle No. 2.

Precast floor, roof system—a booklet describing the Flexicore precast-concrete floor and roof system. Photographs, design data, and detail drawings. Specifications included.

Write to The Flexicore Co., Inc., Dept. C&E, 1932 E. Monument Ave., Dayton 1, Ohio, or use the Request Card at page 18. Circle No. 3.

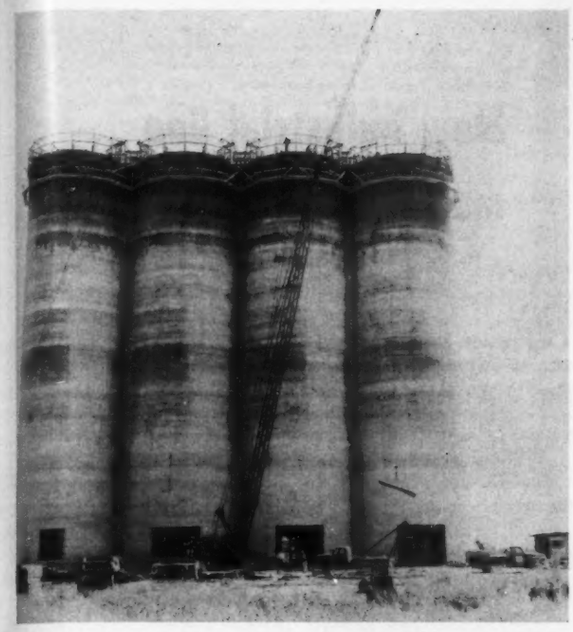
Tunnels to join lower level of George Washington Bridge

Two tunnels, each providing three traffic lanes, will be built through the Palisades in Fort Lee, N. J., by the cut-and-cover method. The tunnels, beneath the present bridge roadway, will be part of the expanded New Jersey approaches to the $183-million lower level of the George Washington Bridge.

A $7,840,653 contract awarded to George M. Brewster & Son, Inc., Bogota, N. J., includes, in addition to the tunnels, construction of two overpasses, widening the north side of the existing main approach bridge over Hudson Terrace, a short emergency ramp from the eastbound lower-level roadway to Hudson Terrace, and installation of utilities.

The westbound tunnel, to New Jersey, will be about 630 feet; and the eastbound tunnel, to New York, will be about 550 feet.

In Manhattan, work on a $1,040,250 contract held by Tully & Di Napoli, Inc., Flushing, N. Y., will begin on curved exit ramps to connect the upper and lower levels of the bridge, with the exit ramps being constructed under previous contracts. Existing bridge-approach roadways east of the New York anchorage will be widened by 6 feet in each direction; and Cabrini Blvd., between 177th and 178th Streets, will be widened to provide two lanes of traffic in each direction, with a dividing island in the center.



REACHING FOR THE TOP, a 30-ton Lorain 56 crawler crane owned by L. W. Connelly & Co., Detroit, hoists reinforcing steel to workmen on the 149-foot-high cement silos at the Dundee Cement Co. plant in Dundee, Mich. About 400 tons of steel was needed for the job.

New industrial line makes spectacular bow

At a big Detroit showing, Massey-Ferguson spotlighted its new line of industrial equipment.

The bright yellow of the new machines showed up well against the dark red and gray of the company's farm-equipment line. With less than two years' experience in the industrial field, the 112-year-old company offered an impressive display of new and improved rubber-tire tractors, backhoes, and loaders.

The meeting, attended by over 4,500 M-F dealers, was held February 20 and 21 in Detroit, Mich. In addition to unveiling the 1959 line of farm and industrial equipment, the conference featured a "Show of Progress" musical extravaganza; a tour of the company's recently enlarged tractor plant in Detroit; and a live telecast from Detroit of the M-F sponsored "Jubilee, U.S.A.," network television show with Red Foley and guest stars.

At the equipment show in the Coliseum, dealers saw the company's line joined by six entirely new or markedly modified and improved machines.

1. The M-F Work Bull 204, presenting an entirely new concept in utility tractors, incorporates instant no-shift change of direction, torque converter, and other features found only in big tractors.

2. The M-F Work Bull 406, an entirely new design in ⅞-cubic-yard industrial tractor-loaders, features

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Issue

Dealer representatives swarm in, over, and around the Massey-Ferguson Work Bull 406, with its ⅜-yard-capacity loader bucket and Davis Model 220 backhoe, at the M-F showing of its new industrial equipment line about a month ago in Detroit. The M-F Work Bull 1001 front-end loader, just beyond, also gets plenty of attention.

instant, no-shift reversing, a torque converter, five equal speeds in either direction, and cockpit location that permits the operator to see equally well both front and rear.

3. The new Davis 220 backhoe—with Hydra-slide that permits fast positioning to dig flush—has many other improvements, including increased operating pressure to 2,150 psi, larger bucket cylinder for 50 per cent faster dumping, and a greater breakaway power up to 14,000 pounds.

4. The new Davis 101 and 102 loaders, both of which can be used with the Davis backhoe, feature faster operation (operating pressure increased to 2,150 psi) and 15 per cent greater strength.

5. The Work Bull 1001 multipurpose tractor-loader features larger, more streamlined profile; improved, more convenient cockpit with weather-protected controls, optional cab; and increased rated capacity to 1 cubic yard, with struck capacity of ¾ cubic yard.

Pretty girls livened up the showing of four late-model Davis backhoes mounted on M-F tractors. The hoe is doing what will be its most glamorous job right now.

6. The Davis 99 economy loader, a low-priced loader that maintains the Davis standard for quality, has a capacity of 2,000 pounds at half height and 1,500 at full height. It has an operating pressure of 2,150 psi, but without down pressure and backhoe mounting.

These new machines, along with other M-F industrial equipment, are manufactured by Massey-Ferguson Industrial Division, 1009 South West St., Wichita, Kans. The Industrial Division was created when Massey-Ferguson purchased Mid-Western Industries, Inc., in mid-1957.

THE END

For more facts, circle No. 364→

H. E. Robison, president and treasurer of the Wheel Trueing Tool Co.

Newly elected president and treasurer of the **Wheel Trueing Tool Co.**, Detroit, is **H. E. Robison.** He succeeds **H. B. Wallace**—founder and president of the company since its inception in 1910—who becomes chairman of the board. Vice president **R. S. Fowler** becomes vice chairman of the board.

Re-elected officers are: **Donald J. Wallace,** vice president of manufacturing; **Harry W. Wallace,** vice president of the diamond drilling division; **James H. Dillow,** secretary; and **Miss E. F. Welsh,** assistant secretary and assistant treasurer.

The new vice president of manufacturing for the **B. F. Goodrich Co.**, Akron, Ohio, is **William W. Scull.** Formerly director of manufacturing services, Scull continues to be responsible, at corporate staff level, for purchasing, traffic, raw-materials planning, engineering design and construction, machine development, time study and methods, industrial engineering, and safety.

Scull is also president of B. F. Goodrich Malaya, Inc., a natural-rubber latex processing company in Malaya and Singapore, and president of B. F. Goodrich Liberia, Inc., the firm's rubber-plantation operation in Africa.

Former first vice president of **McKiernan-Terry Corp.**, Harrison, N. J., **Carl W. Shattuck,** has been elected president, succeeding **John C. Smaltz,** who resigned to devote his time to the engineering and research

Carl W. Shattuck, president of McKiernan-Terry Corp.

work of the firm as its consulting engineer. Shattuck, with the company for 30 years, was previously in charge of its Dover, N. J., plant.

Newly elected first vice president **Herbert G. Dillon** remains in charge of the firm's Mead-Morrison Division

at Harrison. He will promote the design, manufacturing, and sales of heavy material-handling equipment.

Frank Hamilton, Jr., has been elected vice president and will become general manager of the firm's Dover, N. J., works. **G. Robert Compton, Jr.**, has been re-elected vice president of the pile-hammer division.

Jack Neubauer, advertising director and sales promotion manager of **Standard Steel Works, Inc.**, Kansas City, Mo., has been elected chairman of the Bituminous Distributor Manufacturers Bureau of the **Construction Industry Manufacturers Association.**

Jack Neubauer, chairman of CIMA's Bituminous Distributor Manufacturers Bureau.

The bureau, recently organized by the manufacturers of bituminous distributors, is one of CIMA's services to provide sponsorship and guidance for any member companies wishing to form industry-wide or product groups.

George B. O'Connell, special representative for Athey Products Corp.

District representative **George B. O'Connell** has been promoted to special representative for **Athey Products Corp.**, Chicago. He will be in charge of special assignments and sales throughout the United States and Canada, and will work out of the home office.

J. V. S. Norton has been named assistant sales manager of the Eastern region of **Bucyrus-Erie Co.**, South Milwaukee, Wis. Formerly assistant export sales manager working out of the home office, Norton will now have headquarters in the company's New York City office.

William Fornwald has been promoted from sales representative to assistant sales manager of **Sprague & Henwood, Inc.**, Scranton, Pa. He will continue to devote most of his time to promoting the company's complete line of diamond-drilling and soil-sampling equipment.

A new vice president for the **Allis-Chalmers Mfg. Co.**, Milwaukee, is **Beauchamp E. Smith**, who is general manager of the firm's Hydraulic Division, York, Pa. At the same time, the company elected **Joel Hunter** a member of the board of directors. Hunter is president of Crucible Steel Co. of America, Pittsburgh, Pa.

Kenneth J. Boelter, assistant to the general sales manager of Symons Clamp & Mfg. Co.

Kenneth J. Boelter has been promoted to assistant to the general sales manager of **Symons Clamp & Mfg. Co.**, Chicago. In his new position he will be responsible for the selection and training of new salesmen and dealers. For the past three years Boelter has been with the company's city sales staff.

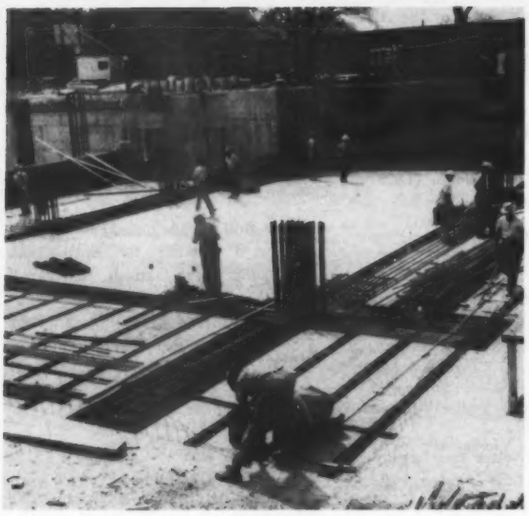
The new East Coast district sales representative for **Insley Mfg. Corp.**, Indianapolis, Ind., is **E. H. Herman.** He will assist and coordinate the sales efforts of the company's distributors in that area and in the Canadian provinces of Ontario and Quebec.

J. R. Randle, representative for the Buffalo-Springfield Roller Co.

The **Buffalo-Springfield Roller Co.**, division of Koehring Co., Springfield, Ohio, has appointed **J. R. "Jack" Randle** a representative in the Central and Mississippi Valley area. For the past eight years, Randle was field secretary for the Associated Equipment Distributors.

Harry F. Rose is now manager of crane and monorail sales for the Yale Materials Handling Division, **The Yale & Towne Mfg. Co.**, Philadelphia. From headquarters in the home plant, Rose will coordinate nationally the specification and sale of Yale hoisting equipment to the manufacturers of cranes and monorail handling systems.

A new director of **The Thew Shovel Co.**, Lorain, Ohio, is **Robert M. Lindstrom.** He is vice president of the National City Bank of Cleveland, and is a director of the American Welding & Mfg. Co., Warren, Ohio.



Forming of the complicated warped slab, background, has been completed for a new Houston parking garage, and the plywood is ready to receive the steel, especially bent to fit the "dished-out" surface. This warped slab, part of the car ramp, has both a banked and a vertical curve.

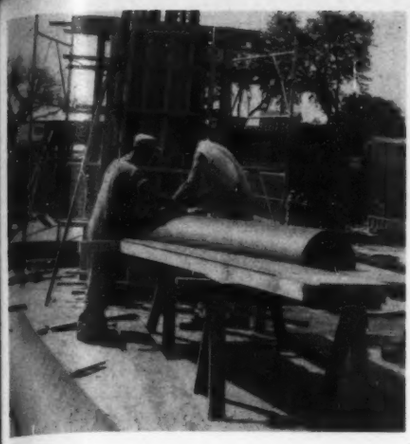
Intricate footings, ramps complicate garage project

From the base of its huge bell-bottom footings to the top of its 7-story warped-slab ramps, a reinforced-concrete parking garage in Houston, Texas, provided architects, engineers, and the contractor with plenty of challenges.

Special equipment had to be built to bore out the 92-inch shaft and 190-inch bells for the largest of the belled footings.

The slabs forming the car ramps created an engineer's headache and a carpenter's nightmare. Warping a banked curve of a ramp into a level floor, with the semicircular section meeting short straight interfloor ramp sections, called for some fancy figuring and some tricky forming.

The high-tensile steel rebars used in the columns required special joining. In going up with the steel, the contractor spliced the No. 11 bars together by means of a welded metal sleeve. High-tensile steel and high-strength concrete cut down on column size and increased available parking area.



◄ Split Sonotubes are used to form the rounded part of the 36 × 18-inch columns, while ¾-inch plywood forms the flat sides. Plywood radius stiffeners and steel bands hold the forms in place.

A Caterpillar D4 with front-end loader grades off one of the basement levels while men in the background form up the warped slab of one of the ramps. Note high-tensile No. 11 reinforcing bars protruding from the Sonotube column in foreground. Six-inch sleeves are welded to the ends of the bars to receive the higher reinforcing steel. ►

These construction problems were taken care of as they arose by The Sebastian Corp., Houston, which held the $1,926,000 general contract. Designed by Hedrick, Stanley & Lightfoot, architects and engineers of Houston, the Professional Building Parking Garage provides six parking levels for 990 cars, plus one shopping level. The split-level, self-parking garage is located at 6414 Fannin St. in Houston. Built for the Hermann Hospital Estate, a charity trust supporting Hermann Hospital at Texas Medical Center, the parking facilities serve primarily the doctors and visiting patients of the adjacent Hermann Professional Building.

The 244×256-foot concrete structure—of self-parking design—contains five levels above the ground and two basement levels. Cars go up or down in the building on two spiraling one-way ramps built on an easy grade from one split level to the next. Passengers may use any of four Westinghouse automatic elevators to descend to the street or shopping level.

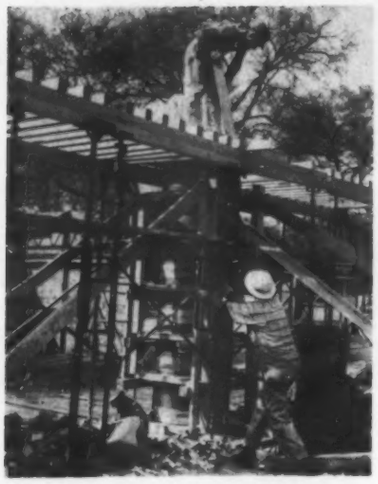
The exterior at ground level is glass and aluminum with stone facing to match the adjacent Hermann Professional Building. The upper walls on all four sides are made up of vertical Zourite panels. The gray and brown vertical panels, which extend the height of the building, are staggered to provide for ventilation. A tunnel below the basement floor has forced ventilation to exhaust fumes from the two parking floors below the street level.

Belled footings save money

Although the big belled footings required special construction methods, the engineers estimated that this type of foundation saved some $40,000 over spread footings. Since the borings were the largest that had been drilled in the area, there was some question as to whether the job could even be done.

For the 190-inch bell bottoms on the largest footings, L. R. "Dutch" Raitz, the drilling subcontractor, built a special bucket. Handled by a rotary drill rig that started out with an 80-inch shaft or bore, the bucket was equipped with two cutting blades designed to fan out from the bottom of

(*Continued on next page*)



Workmen form up the beams, working atop a framework of double 2 × 10's and 4 × 4's at 1-foot centers, with the whole structure supported by Time-Saver scaffolding. The beams themselves are formed by plywood, while J & B long-leaf steel pans form the floor.

A De Walt bench saw, set up inside the building area, precuts much of the form lumber. Time-Saver scaffolding supports formwork for beams in the background.

(*Continued from preceding page*)

the bucket. As the cutting blades worked outward, they made a dome-shaped bell. They were retracted in lifting cuttings. In drilling the first of these footings, there was a little trouble with earth sloughing off at the top of the bell near the bore of the shaft. Increasing the shaft diameter about a foot for a total diameter of 92 inches took care of the problem in this instance.

The footings were drilled to an over-all depth of about 18 feet to a mixture of clay and caliche with a bearing strength of 10,000 pounds per square foot. The total load supported at each footing was figured at 1,760,000 pounds.

To fill up the big hole with concrete as soon as it was drilled—cave-ins were always a possibility—as many as six transit-mix trucks were grouped around the boring at one time. As the concrete filled the bell, workmen set a cage of reinforcing steel that extended for the depth of the bore. In only a matter of minutes, the total of 45 cubic yards of concrete was chuted into the hole.

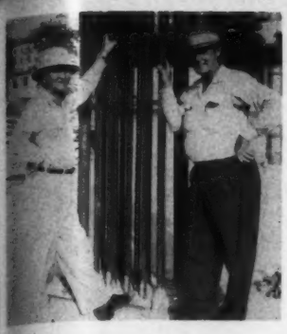
Warped slabs tricky to form

The 15-inch-thick slabs that contained the "dished-out" curves for the car ramps sometimes had the field engineer and the carpenters scratching their heads. Supported only at its edges, the 38×66-foot slab formed a ramp with banked sides. To make the calculations simpler, the elevations of the 13.5-foot-wide ramp were placed on vertical profile curves which permitted at a glance the determination of the elevations at any given point.

Time-Saver adjustable scaffolding was used to support the forms for the ramp slab. The towers of tubular scaffolding held double 2×10 purlins that carried the 4×4 joists. The ¾-inch plywood sheets that support the concrete pour had to be cut in complicated shapes where the curve met the floor slab.

In pouring the slabs on the lower levels, transit-mix trucks dumped into two 1-yard collection hoppers that fed the concrete to four Gar-Bro Power-carts and one Whiteman Power Buggy. Using three of the self-propelled concrete carriers, the contrac-

(*Continued on next page*)



Field engineer W. J. Bardin, left, and W. H. Davis, superintendent for Sebastian, pose beside an unfinished column. Note sleeves at top of high-tensile steel rebars.

lar was able to pour about 55 cubic yards an hour. A Mack truck with a Smith mixer first poured a 3-inch seal slab on the clay bottom.

After Muller and Whiteman power trowels floated and finished the concrete, it was given a final hand-trowel finish. Sand and water cured the concrete for about seven days.

High-strength steel in columns

On the two lower levels, high-strength steel combined with 5,000-pound concrete made it possible to reduce the size of the columns and gain more floor space. The No. 11 bars of 75,000-psi yield-point steel were machined at their ends so that one length would sit flush on top of another length. Their ends fitted into a 6-inch metal sleeve that was spot-welded to the rebars. This connection considerably cut the labor involved in tying a normal column with 20-bar-diameter lap joints.

Between the first and second floors above the ground, a transition was made to 50,000-psi yield-point steel and 3,000-pound concrete. The column size remained the same.

To afford a desirable parking pattern and to permit the maneuvering of automobiles, the columns were spaced quite far apart. In one direction, they were on 37-foot centers, and in the other direction the spacing alternated from 36 to 28 feet. Even with these large spans, beam depth never exceeded 22 inches. No truss bars were used in the beams, thus simplifying installation of the steel.

The rounded ends of the 18×36-inch columns were conveniently formed with Sonotubes. The tubes, split in half, formed two ends of the column, while plywood formed the flats or wide sides of the columns. Steel bands, as well as frames of wood wales, held the form together.

Long pans form floors

Long-length steel pans, normally free-spanning 10 feet, simplified the forming of the floors. Manufactured by J & B Co., Houston, the pans were 15 inches deep and gave a 6-inch-wide joist. The ends of the pans normally terminated in a transverse joist section supported by Waco adjustable steel shores.

Personnel

For Sebastian Corp., the general superintendent was W. H. Davis. W. J. Bardin, field engineer, did the complicated layout work on the building. The field representative for Hedrick, Stanley & Lightfoot was Richard Floyd; for the owner, Irving Brown.

THE END

Construction camera

Eleven passes by this Trojan 154 tractor shovel are enough to load this 20-ton semitrailer with gravel for Atlantic Gravel Co., Toms River, N. J. The rig also makes a ¼-mile run to the sand stockpile to load trucks and a 500-yard run to charge a crusher hopper for the owner.

A team job is done in Billings, Mont., by two P&H cranes to erect a huge revolving clock atop a 6-story building. The 12½-ton crane with 40-foot boom brought half the clock to the site and is ready to transfer it to the 25-ton P&H with 120-foot boom for the high lift.

Six-bay hangar to feature cable-suspended roof at New York airport

A $10 million 6-bay hangar for five foreign-flag air lines at New York International Airport features a cable-suspended steel cantilever roof. A $1,912,450 contract for Hangar 17 also covers concrete paving for a 26-acre aircraft parking area and bituminous-macadam paving for 12 acres of automobile parking. This contract is held by B. Turecamo Contracting Co., Inc., of Brooklyn, N. Y. The hangar is located on a 49-acre site in the southwest section of the airport.

Planned for completion in the summer of 1960, the hangar will be used by Air France, British Overseas Airways Corp., KLM-Royal Dutch Airlines, Lufthansa German Airlines, and SABENA-Belgian World Airlines. These lines have a 20-year joint lease.

An expansion of the present electrical distribution system includes four additional electrical feeders to serve Hangar 17.

Hourly production for this Cedarapids crushing setup at Buckley Field AFB near Denver, Colo., is 160 tons of ½-inch-minus rock for use in runway overlay at the field. The entire setup is mobile, the International power units as well as the Master and Commander, Jr., being on wheels.

Part of one of the longest pipeline jobs now under way—a 1,517-mile natural-gas line from southern Texas to Miami—is being done parallel to Florida's Sunshine State Parkway. The Allis-Chalmers tractor supports pipe and the wrapping machinery that applies the protective plastic coating.

Course on asphalt paving to be held at Cornell

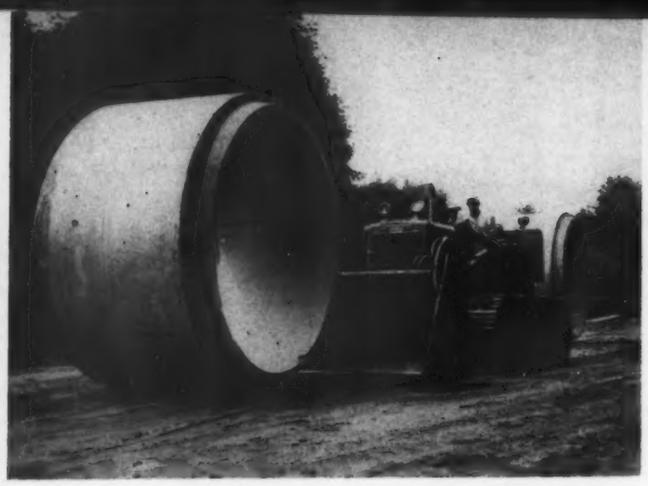
A program of instruction in asphalt paving, designed for instructors in the field, will be offered by Cornell University this summer.

Beginning June 16, the course will meet four mornings a week at Hollister Hall, the new civil engineering building on the campus. Laboratory sessions will be held in the afternoons and will be supplemented by field trips and seminars.

The program is supported by The Asphalt Institute, which has made available 16 grants-in-aid of $800 each to selected applicants who are members of engineering college or research staffs, or who expect to teach in institutions offering engineering instruction in highways or materials.

Application should be made to Professor Taylor D. Lewis, College of Engineering, Lincoln Hall, Cornell University, Ithaca, N. Y.

The Arizona State Highway Department has 227 miles of highways under construction as of last month.



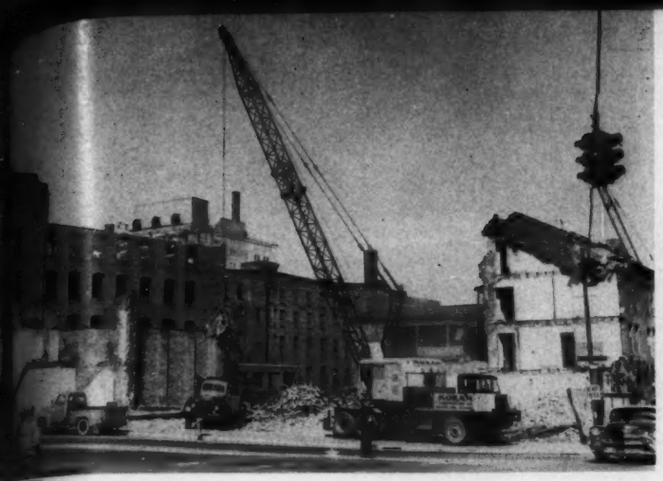
Rolling along to a waiting crane is a 9-foot section of concrete sewer pipe pushed by the bucket of International Drott TD-14 Four-in-One. The operator uses the bucket to inch the section along without risk of breakage to the pipe. The bucket is also used to carry 54-inch pipe.

Footing excavation is handled to exact dimension by a Gradall for the 18-story California Bank Building in Los Angeles. The rig also placed concrete, which was lowered in buckets to the floor of the excavation, and did the final sloping of banks to the top of the footings.

Iowa Highways names head of new urban department

The Iowa State Highway Commission has appointed C. B. Anderson to head its newly formed urban department. In his new post, Anderson will organize and consolidate urban design projects, and intensify coordination with city officials on work within municipalities in connection with the improvement of primary and farm-to-market road extensions. The new department will help correlate highway development with city-street programs, land use, and urban renewal projects.

At the same time, Donald E. McLean has been named to head the design department, replacing Anderson, and Kenneth P. McLaughlin has been promoted to road engineer, assisting McLean. Robert E. Merrill has been appointed engineer of special assignments; and Melvin B. Larsen, who was formerly Merrill's assistant, will head the secondary-roads department.



Demolition of old housing in Hartford, Conn., marks the first step in the reconstruction of this area into a $100 million shopping and business center. The Lorain 30-ton Moto-Crane is using a ¾-yard clamshell on an 80-foot boom to load out debris to haul trucks.

Fill material needed for the relocation of State Route 116 near Amherst, Mass., is spread along the right-of-way by a Michigan Model 380 tractor-dozer. Some 5,000 cubic yards of sandy loam brought to the project by dump trucks is spread daily by the 375-hp rig.

Cargo distribution units to go up in New Jersey

Four single-story cargo distribution buildings are under construction at Port Newark, N. J. Costing $3,300,000, the buildings will have a total area of 416,000 square feet when completed in 1960.

Each building, 640 feet long and 160 feet wide, is divided into four sections. The structures are at truck-bed height, with backup space on one side and a railroad siding on the other. All door openings will have protective canopies.

Other features of the new buildings will include a clear interior height of 20 feet and asphaltic-concrete floors capable of supporting a 500-pound-per-square-foot floor load. About 128,400 square feet of paved truck backup area will be provided in addition to 32,400 square feet of paved open area at the ends of the buildings for open storage or parking.

Another four-building distribution center is now under construction on the south side of the seaport in the area south of Calcutta Street.

Contractor overcomes many complicated problems on freeway interchange job

Two Lorain cranes bucket concrete to the deck of one of the four bridges in the San Diego interchange of the Mission Valley Freeway. One of the complicated jobs for the contractor was erecting heavy falsework that provided clearance for traffic using the Alvarado Canyon Freeway.

Building a San Diego, Calif., interchange, consisting of four bridges, related drainage, grading, paving, and miscellaneous work, constituted a 16-month $1.65 million project for the Griffith Co., Los Angeles.

Decks of the structures, which carry the Mission Valley Freeway over the Alvarado Canyon Freeway, are 30-inch-deep concrete slabs with 16-inch Sonovoids creating a box-girder type of construction.

Handling the Alvarado Canyon drainage, moving some 8,000 feet of 36, 24, and 18-inch water mains, and maintaining traffic through the job site during construction made the project a complicated one.

This interchange is one of a series of projects, being built by the California Division of Highways, which will make U. S. 80—the Mission Valley Freeway—a true freeway through San Diego and easterly to El Cajon.

The contractor worked on the preliminary operations for about six months before he could start the structures. These early operations included re-laying the big water mains, constructing a new channel for a

Concrete is about to be dumped over the 16-inch Sonovoids in one of the long-span bridges. The Sonovoids in the 30-inch-deep deck will provide a box-girder effect. In the background is the Cmetco vibratory screed used to finish the slab.

tributary of the San Diego River, building a detour, and grading some of the approaches.

Build four bridges

With the exception of one of the smaller structures, which rests on Raymond concrete piles, the bridge piers are founded on spread concrete footings. Most of the footings are 7.25 feet square, with separate 2.5×3-foot columns making up the piers.

The two largest structures are a side-by-side pair which carry the Mission Valley Freeway over the Alvarado Canyon Freeway (Fairmount Avenue). Each of these twin bridges has a 46-foot roadway, with 11 feet of median on each structure making a total separation of 22 feet. The two structures together make up a deck width of 120 feet. The decks of these bridges are the deep slabs with Sonovoid inserts.

Heavy shoring required

One of the first problems encountered in forming these decks was the construction of a shoring system that would permit traffic to pass underneath while the structures were being built. To provide a firm foundation for the shoring, Griffith built

(Continued on next page)

A Raymond Concrete Pile Co. skid rig drives Raymond step-taper piles for the footing of one of the bridges. Most of the footings are 7.25 feet square; 2.5 × 3-foot columns make up the piers.

(*Continued from preceding page*)

concrete footing walls with footings 3 feet wide and 9 inches thick, and a 14-inch wall of variable height.

On this wall, 14×14 timber columns supported heavy steel beams that spanned the 28-foot roadways. On these girders, 8×8 timber stringers were placed at 3-foot centers to support the form joists. These joists were 2×4's laid flatwise at 12-inch centers. A floor of ⅝-inch plywood completed the deck of the form.

Since it was not necessary for traffic to be carried underneath the shorter end spans, forms for these spans consisted of 6×18 timber stringers at 4-foot centers, 2×6 joists at 12-inch centers, and the ⅝-inch plywood deck.

Sonovoids tied down

After the bottom layer of steel had been placed, the 16-inch Sonovoids were set in and tied down to the bottom form to prevent flotation when the concrete was placed. Special Sonovoid cone-type tie-down clamps were attached to the form bottom and tied to the Sonovoids with Signode steel strapping. The Sonovoids, tie-downs, and other form hardware were furnished by W. J. Burke & Co. through its San Diego branch.

After the top steel was placed, the deck was ready for concrete. On these large slab pours, two Lorain motor cranes bucketed the concrete from transit mixers to the deck in shop-built ¾-yard buckets. After the concrete had been vibrated down around the Sonovoids and the steel, the surface was screeded to grade with a

(*Continued on page 158*)

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Concrete for the mile of approach-road paving required on the project is dumped to forms by a Koehring 34-E Twinbatcher paver. Finishing operations are done by a Johnson float.

(*Continued from page 156*)

Cmetco telescoping vibrating screed. This screed could be expanded to a length of 36 feet. The concrete was supplied by Fenton Ready Mix Co., San Diego.

The major structures required about 4,000 cubic yards of concrete, with an additional 1,000 yards going into the smaller structures on the job. A total of 850,000 pounds of reinforcing steel was used.

After the structures were built and the grading was completed, a combination of concrete and asphaltic pavements was laid.

Work for the Griffith Co. was supervised by general superintendent Lloyd Leonard and bridge superintendent H. A. Topham. The district manager of Griffith's San Diego Branch is Ray Preston.

Resident engineer for the California Division of Highways on the project was D. C. Smith. The bridge work was supervised by bridge representative W. C. Cryderman. The work in this area is under the supervision of district engineer Jacob Dekema and district construction engineer Clarence Walcott of the Division's District XI. THE END

Michigan erects unique vertical-lift bridge

Work has started on the $5,933,807 superstructure of Michigan's most unique bridge, the vertical-lift Houghton-Hancock Bridge which will carry U. S. 41 across the Portage ship canal. The bridge is unique in that it will be the first vertical-lift bridge on the state trunk-line system, and it will have two levels—the upper for vehicular and pedestrian traffic and the lower for railroads.

The 1,310-foot-long bridge consists of a 253½-foot-long center lift span, two 120-foot-long lower spans flanking the center span, and eight deck-girder spans, four on each end of the bridge, totaling 800 feet in length.

When trains are not using the lower-level train deck, the center lift span will be elevated and the train deck will become the vehicular deck.

The American Bridge Division, U. S. Steel Corp., Pittsburgh, holds the contract for the superstructure and machinery.

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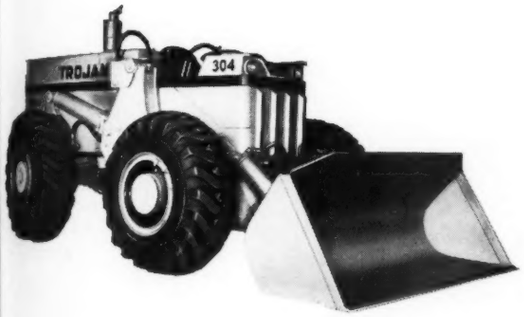

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For more facts, use Request Card at page 18 and circle No. 403

Replaces two crawlers and a compactor with one Michigan... ups output 50%...

Cuts compaction costs $15 per hour

By buying a machine with a "built-in bonus," **a midwest** roadbuilder is saving **at least $15 per** operating hour.

Tri-County Trucking Company of Detroit subbed the sand sub-base and all aggregate haul—about 500,000 yards—from Holloway Construction Co, Livonia, Mich, on a 9-mile leg of new Interstate Highway 23 north of Toledo. The sub-contractor knew he'd be pushing a lot of sand fill, so he got to thinking. Sand is hard on crawler tracks—so why not use a heavy rubber-tired dozer?

The unit chosen was a 262 hp, 51,000 lb Michigan Model 280 Dozer. Each 26.5-25 tire was hydroflated with calcium chloride solution—1,750 lbs per tire. Rig was put to work two shifts per day, 6 days per week.

It soon proved fast enough and mobile enough to easily spread the sand delivered by 35 ten to seventeen-yard trucks and semi-trailers. Its output *averaged* 3,000 bank yards (per government cross-section) per 10-hour shift. (In contrast, a 35,000 lb crawler, used elsewhere on the 9 mile job, regularly spread 2,000 yards per shift. Completed lifts in both cases averaged 9 to 12 inches deep.) But there was an unexpected bonus, too . . .

97% Proctor in 2 to 4 passes

The Michigan, working alone, effectively met compaction specs of 95% Proctor. In fact, government tests showed 97% average compaction, after only two to four passes, *including* passes made to spread. No specialized compaction equipment was needed. Thus, says Boyce Grubb, company treasurer, "we eliminated expected use of a tractor-drawn 25 ton roller which, we estimate would have cost us at least $15 per operating hour."

There were other savings too!

1 Michigan's low-pressure tires and rear wheel steer did not tear up fill as other dozers often do!

2 The Michigan alone graded to within a few inches of final specs. According to Supt Tom Quaine, the fill thus required only touchup with a grader.

3 Michigan's 28 mph "go-anywhere" mobility enabled it to move from one end of the grade to another, 9 miles, in 30 minutes or less.

4 Tires, rolling over the sand, instead of grinding in it, saved much of the repair and greasing time needed with each crawler, according to Mr. Quaine.

You can check these savings first hand on *your* job. Just call your Michigan Distributor for a no-obligation demonstration. Four size Michigan Dozers to choose from: 165, 262, 375, or 600 hp.

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